Documentation of Slug Tests Conducted at PSC 47, Jacksonville Naval Air Station, Jacksonville, Florida

U.S. Geological Survey

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Environmental Technical Support Branch

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Documentation of Slug Tests Conducted at PSC 47, Jacksonville Naval Air Station, Jacksonville, Florida

Prepared by Hal Davis
Reviewed by Gary Mahon

SUMMARY OF SLUG TEST RESULTS:

Monitoring Well	Well Depth, in ft	Screen Length, in ft	Hydraulic Conductivity, in ft/day
MW13S	14.5	10	4
MW13D	49.0	5	3
MW15S	13.0	10	7
MW15D	47.0	5	3
MW16S	13.0	10	4
MW16D	41.5	5	0.8
MW17S	12.5	10	3
MW17D	42.0	5	0.6
MW18S	14.0	10	3
MW18D	46.0	5	0.3
MW19S	12.5	10	4
MW20I	25.0	5	3
MW23S	15.0	10	4
MW24D	15.0	5	7
MW25S	14.0	10	3
MW26S	13.0	10	4
MW27S	13.0	10	3

INTRODUCTION

Slug tests were performed on 17 monitoring wells located at PSC 47 of the Jacksonville Naval Air Station, Jacksonville, Florida. PSC 47 is a contaminated site and the contamination consists of pesticides and some chlorinated solvents. A description of the wells used for the slug testing is given in table 1, and the well locations are shown on figure 1. The purpose of the slug testing was to determine the hydraulic conductivity of the surficial aquifer at this site.

Table 1. Well characteristics and slug test results.

[a: falling head slug tests are not applicable when the water table intersects the well screen; b: the discrepancy between the theoretical displacement calculated from the slug volume and well diameter was greater than 20 percent of the observed displacement in the well.]

Monitoring Well	Depth, in ft	Screen Length, in ft	Hydraulic Conductivity From Falling Head Test, in ft/day	Hydraulic Conductivity From Rising Head Test, in ft/day	Recommended Hydraulic Conductivity, in ft/day
MW13S	14.5	10	na[a]	4	4
MW13D	49.0	5	3	3	3
MW15S	13.0	10	na[a]	7	7
MW15D	47.0	5	3	3	3
MW16S	13	10	na[a]	4	4
MW16D	41.5	5	0.8	0.8	0.8
MW17S	12.5	10	na[a]	3	3
MW17D	42.0	5	0.6	0.5	0.6
MW18S	14.0	10	na[a]	3	3
MW18D	46	5	0.3	0.3	0.3
MW19S	12.5	10	3[a]	4[b]	4
MW20I	25.0	5	2	3	3
MW23S	15.0	10	4	4[b]	4
MW24D	10	5	7	7	7
MW25S	14.0	10	na[a]	3	3
MW26S	13.0	10	na[a]	4	4
MW27S	13.0	10	na[a]	3	3

The surficial aquifer at the site consists of a combination of interbedded fine sands, silts, and clays (figure 2). It also contains the water table. Underlying the surficial aquifer is the very low permeability Hawthorn Formation. The lithology logs for all the wells are contained in Appendix A.

During the slug testing water levels were measured using Solinst Levelogger series pressure transducers and were checked periodically by hand measurements using an electric tape. The slug tests were analyzed using a spreadsheet based program documented by Halford and Kuniansky (2002) using the Bower and Rice method (1976).

The field procedure for all the tests was as follows: 1) the pressure transducer was installed in the well and allowed to equilibrate for about 10 minutes, 2) the slug was lowered into the well, 3) water levels were collected until the water level in the well returned to the original water level [resulting in a falling-head slug test], 4) the slug was pulled out of the well [resulting in a rising-head slug test] and water levels were collected until the original water level was reached, 5) the pressure transducer was removed from the well and the data were downloaded to a laptop computer. The sampling rate for the transducer was 1 second for almost all the tests. However, a few of the tests used a sampling rate of 5 seconds because they had slow recovery rate. The data are contained on a CD-ROM disk accompanying the report.

SLUG TEST RESULTS AND DISCUSSION

The horizontal hydraulic conductivities determined for the water table wells are shown in figure 3, and the conductivities for the deeper confined wells are shown in figure 4. All of the slug test information and results are shown in figures 5 through 30; the figures are presented by ascending well number although they are not discussed in this order. In the shallow wells, where the water-table intersects the well screen, falling head tests are not applicable because water will flow into the vadose zone and this will result in a calculated hydraulic conductivity that is too high (Bouwer, 1988).

In general the slug test analysis was relatively simple, a straight line was fitted to the slope of the measured data and the program calculated the horizontal hydraulic conductivity based on the Bower and Rice method (1976). The sand pack in some of the water table wells extended above the standing water level in the well. The result of this construction was that the sand pack filled and drained with each test for these wells. Evidence of this can be clearly seen on the data from well MS16S (figure 11). The uniformly sloping data during the first 20 seconds of the test was the sand pack draining; the second

straight line segment is due to the aquifer hydraulic conductivity (Bower, 1979) and is the data fitted to the straight line. All of the wells in which the well screen intersected the water table showed this to some degree. The data from the confined wells showed a uniform slope from the first few seconds of the test until near the end. An example of this can be seen in the data form MS15D (figure 9).

The hydraulic conductivities were fairly uniform for the water table wells and ranged from 3 to 7 ft/day (figure 3). These values fall within the ranged of expected values for the station compared to three 24-hour multiple well aquifer tests previously performed at the station. The first was conducted in a silty sand that produced a hydraulic conductivity of 5.0 ft/day (Davis, 1995); the second was conducted in a relatively clean fine sand that produced a hydraulic conductivity of 20 ft/day (Davis, 1996a); and the third was conducted in a fine sand with silt and clay that produced a hydraulic conductivity of 0.6 ft/day (Davis, 1996b).

The hydraulic conductivities for the confined wells computed for these tests ranged from 0.3 ft/day to 7 ft/day (figure 4). Based on the above discussion, these are within the range of values expected at the Air Station. The confined wells had the greatest range of conductivities computed at the site, indicating that the lithology may be more variable in the deeper part of the surficial aquifer than in the shallower part.

REFERENCES

Bouwer, H. and Rice, R.C., 1976, A slug test for determining hydraulic conductivity of unconfined aquifers with completely or partially penetrating wells: Water Resources Research, Vol. 12, No. 3, p. 423-428

Bouwer, H., 1988, The Bouwer and Rice slug test - an update: Ground Water, Vol. 27, No. 3, p. 304-309

Davis, J. H., 1995, Documentation of aquifer test conducted near Operable Unit 1 at the U.S. Naval Air Station, Jacksonville, Florida, U.S. Geological Survey Open-File Report, 25 p.

-----, J. H., 1996a, Documentation of aquifer test conducted at Area D, Operable Unit 3, U.S. Naval Air Station, Jacksonville, Florida, U.S. Geological Survey Open-File Report, 30 p.

-----, J. H., 1996b, Documentation of aquifer test conducted at Area A, Operable Unit 3, U.S. Naval Air Station, Jacksonville, Florida, U.S. Geological Survey Open-File Report, 15 p.

Halford, K.J. and Kuniansky, E. L., Documentation of spreadsheets for the analysis of aquifer-test and slug-test data: U. S. Geological Survey Open-File Report 02-197, 50 p.

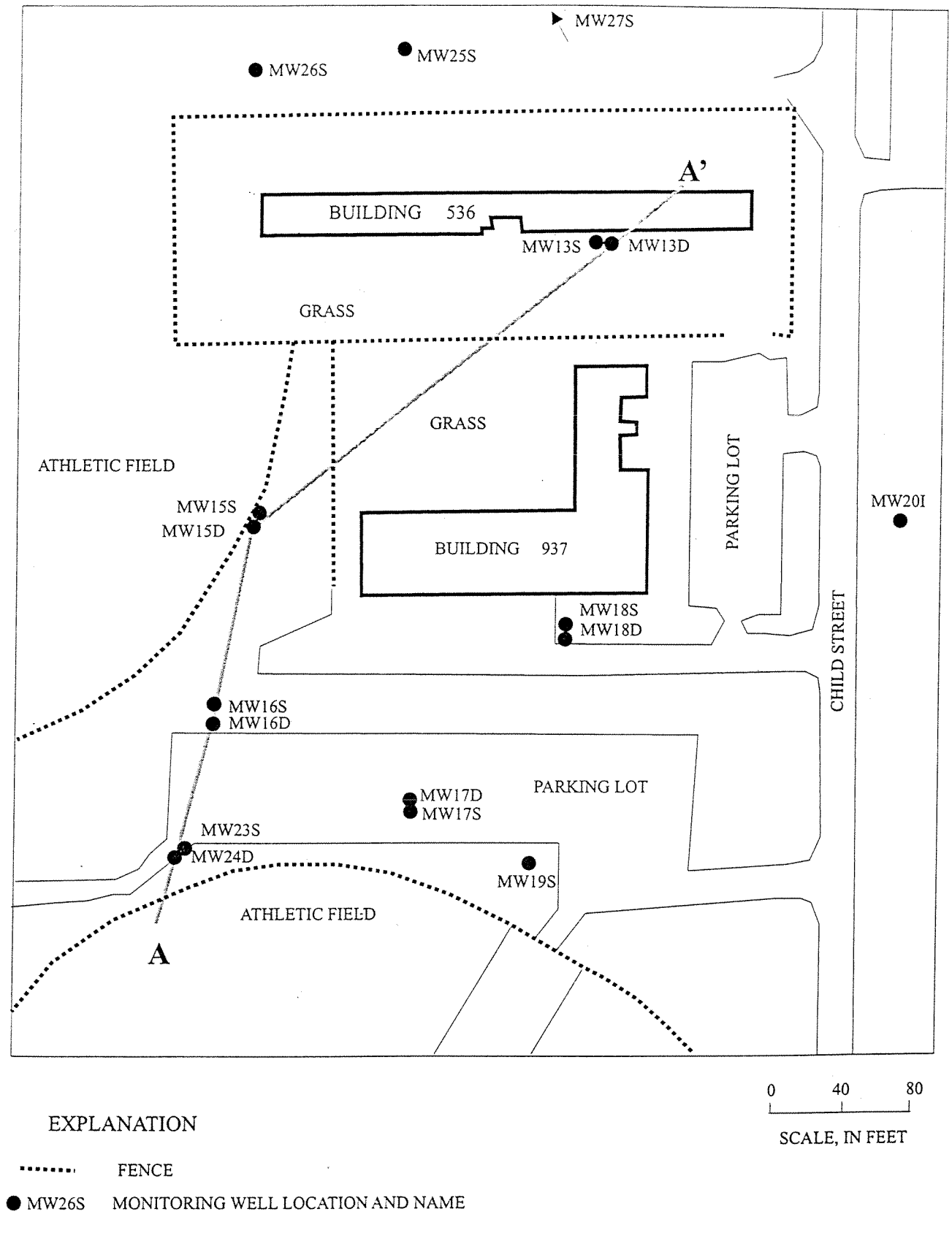


Figure 1. Location of wells used for slug testing at PSC 47.

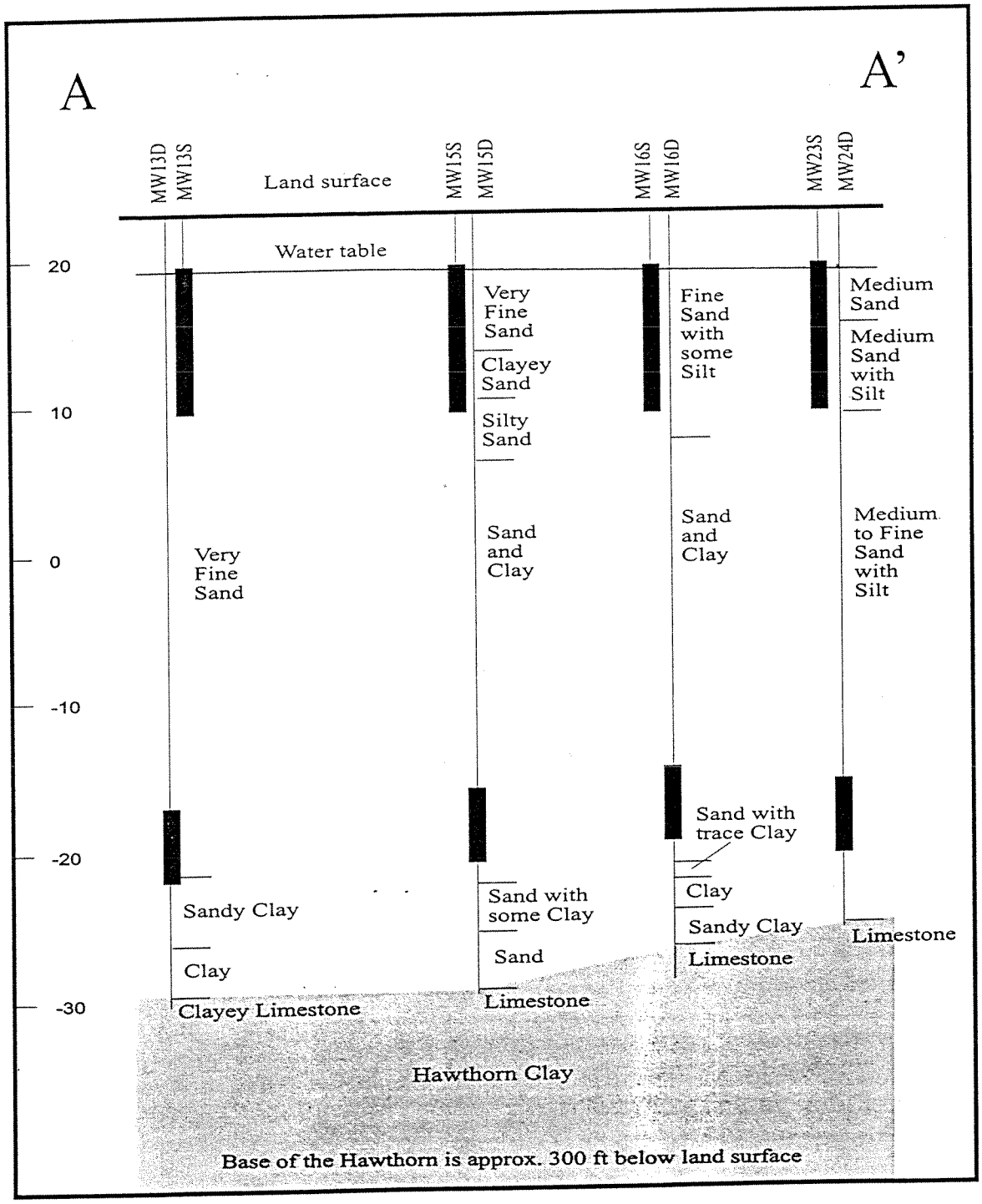


Figure 2. Geologic cross section at PSC 47.

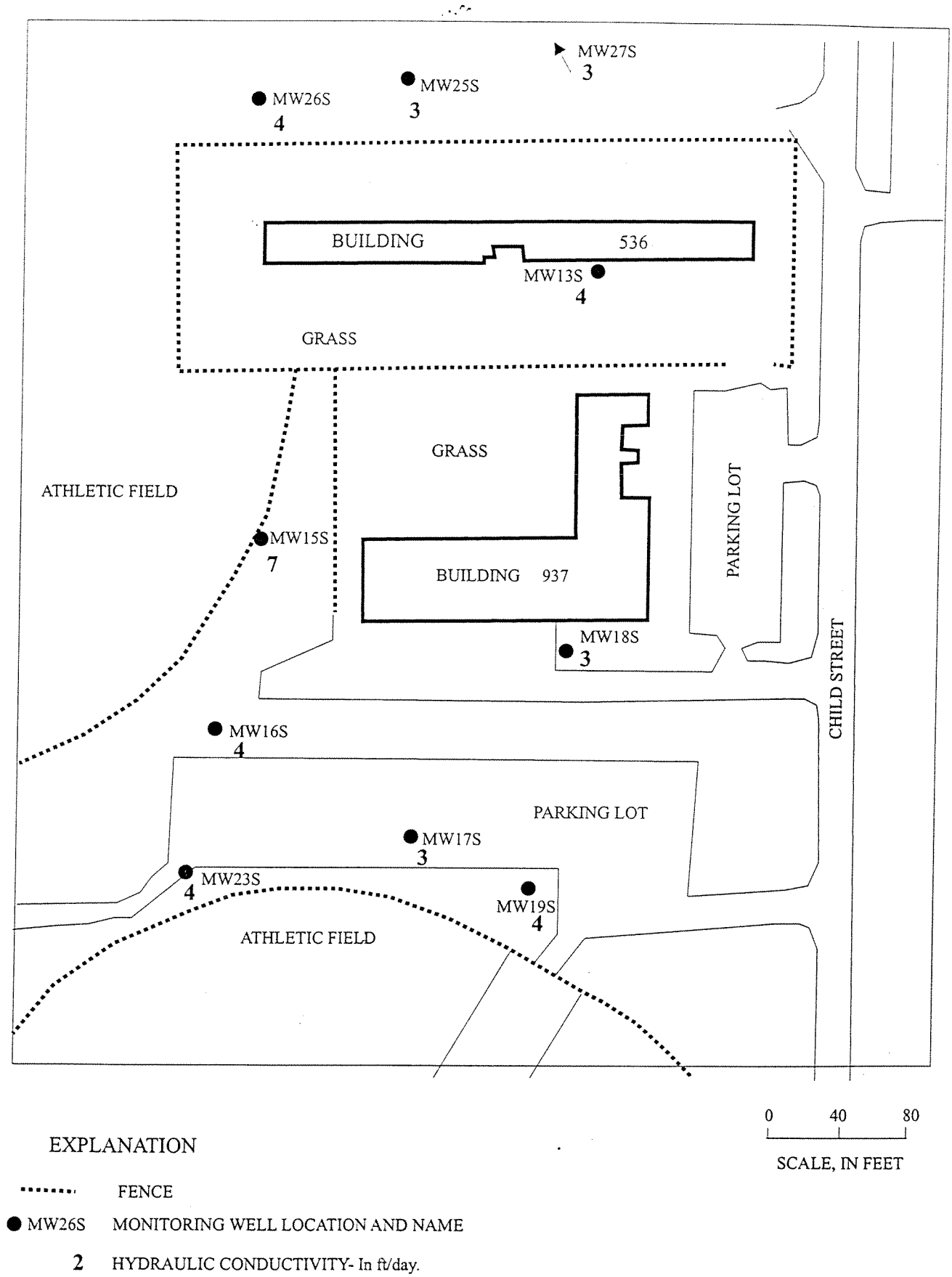


Figure 3. Hydraulic conductivities in the water table wells.

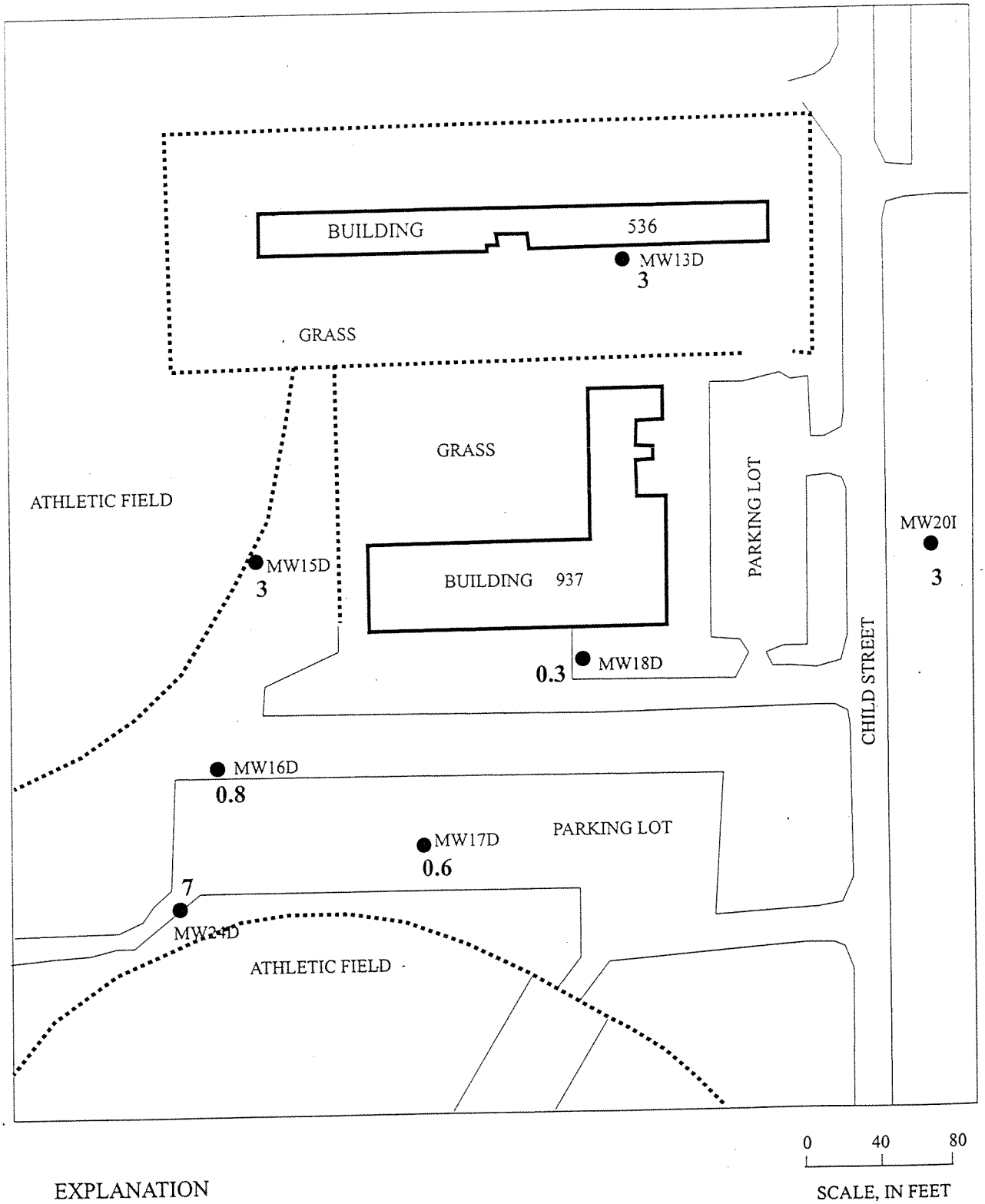


Figure 4. Hydraulic conductivities in the confined wells.

WELL ID: MS-13S

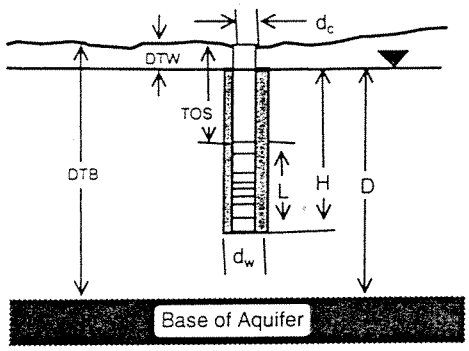
Local ID:

Date: 2/13/2003

Time: 0:00

INPUT

Construction:	
Casing dia. (d_c)	2 Inch
Annulus dia. (d_w)	8.25 Inch
Screen Length (L)	10 Feet
Depths to:	
water level (DTW)	4.82 Feet
top of screen (TOS)	2.5 Feet
Base of Aquifer (DTB)	12.5 Feet
Annular Fill:	
across screen --	Medium Sand
above screen --	Backfill
Aquifer Material --	Surficial Aquifer, centr



COMPUTED

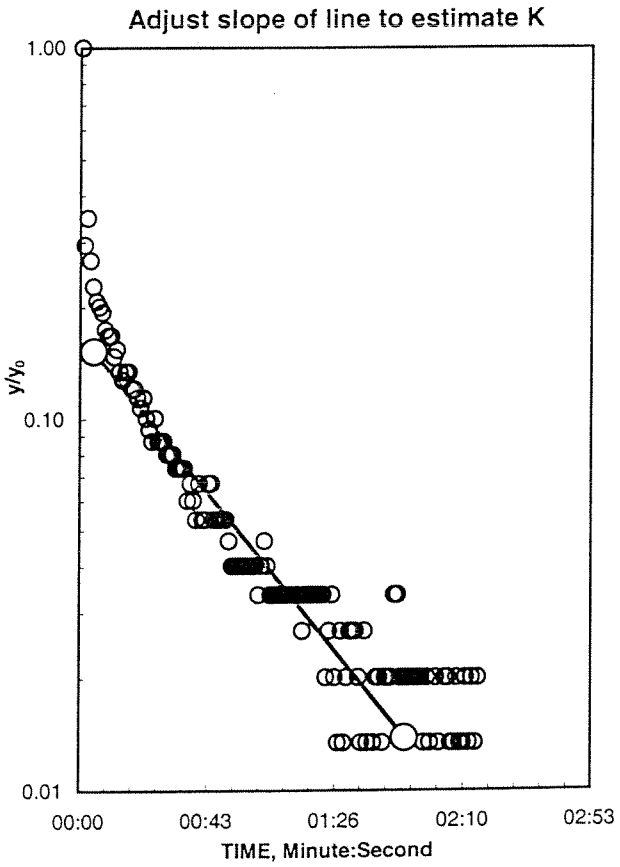
L_{wetted}	7.68 Feet
D =	7.68 Feet
H =	7.68 Feet
L/r_w =	22.34
$y_{0\text{-DISPLACEMENT}}$ =	1.49 Feet
$y_{0\text{-SLUG}}$ =	1.27 Feet

From look-up table using L/r_w

Fully penetrate C =	1.817
ln(Re/rw) =	2.296
Re =	3.42 Feet
Slope =	0.009877 $\log_{10}$/sec
$t_{90\%}$ recovery =	101 sec

Input is consistent.

K = 2 Feet/Day



REMARKS:

Bouwer and Rice analysis of slug test, WRR 1976

Falling head test.

Figure 5. Results of falling-head slug test for well MW13S.

WELL ID: MS-13S

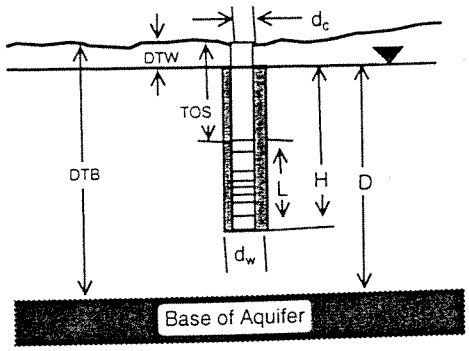
Local ID:

Date: 2/13/2003

Time: 0:00

INPUT

Construction:	
Casing dia. (d_c)	2 Inch
Annulus dia. (d_w)	8.25 Inch
Screen Length (L)	10 Feet
Depths to:	
water level (DTW)	4.82 Feet
top of screen (TOS)	2.5 Feet
Base of Aquifer (DTB)	12.5 Feet
Annular Fill:	
across screen --	Medium Sand
above screen --	Backfill
Aquifer Material --	Surficial Aquifer, centr



COMPUTED

L_{wetted}	7.68 Feet
D =	7.68 Feet
H =	7.68 Feet
L/r_w =	22.34
$y_{0\text{-DISPLACEMENT}}$ =	1.09 Feet
$y_{0\text{-SLUG}}$ =	1.27 Feet

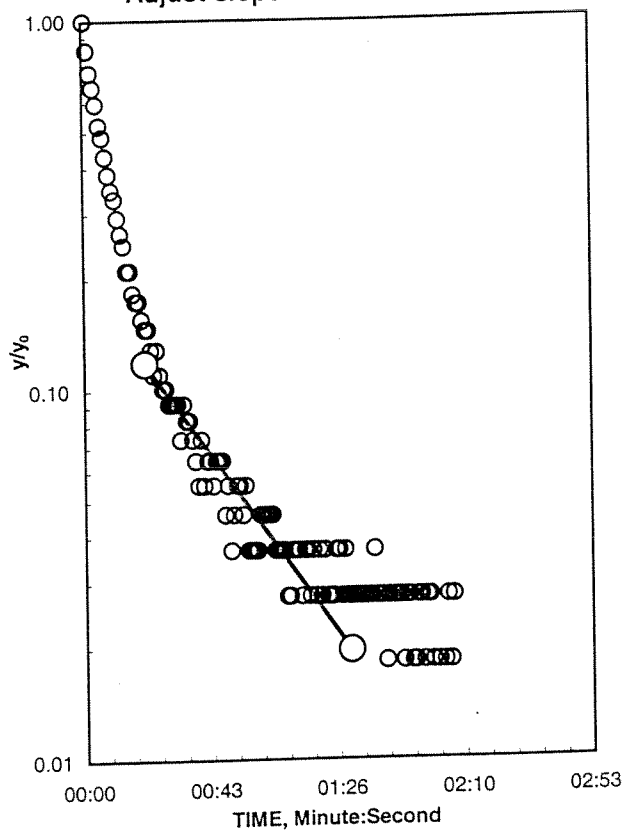
From look-up table using L/r_w

Fully penetrate C =	1.817
ln(Re/rw) =	2.296
Re =	3.42 Feet
Slope =	0.011145 $\log_{10}$/sec
$t_{90\%}$ recovery =	90 sec

Input is consistent.

K = 2 Feet/Day

Adjust slope of line to estimate K



REMARKS: Bouwer and Rice analysis of slug test, WRR 1976

Rising head test.

Figure 6. Results of rising-head slug test for well MW13S.

WELL ID: MS-13D

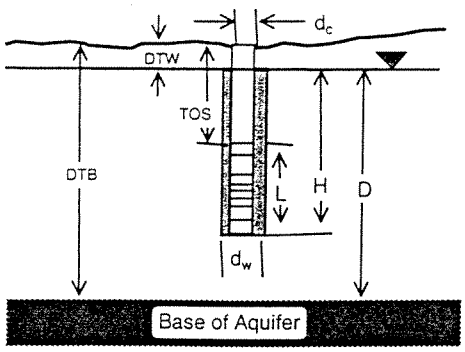
Local ID:

Date: 2/11/2003

Time: 0:00

INPUT

Construction:	
Casing dia. (d_c)	2 Inch
Annulus dia. (d_w)	8.25 Inch
Screen Length (L)	5 Feet
Depths to:	
water level (DTW)	2.64 Feet
top of screen (TOS)	37 Feet
Base of Aquifer (DTB)	42 Feet
Annular Fill:	
across screen --	Medium Sand
above screen --	Bentonite
Aquifer Material --	Surficial Aquifer, centr



COMPUTED

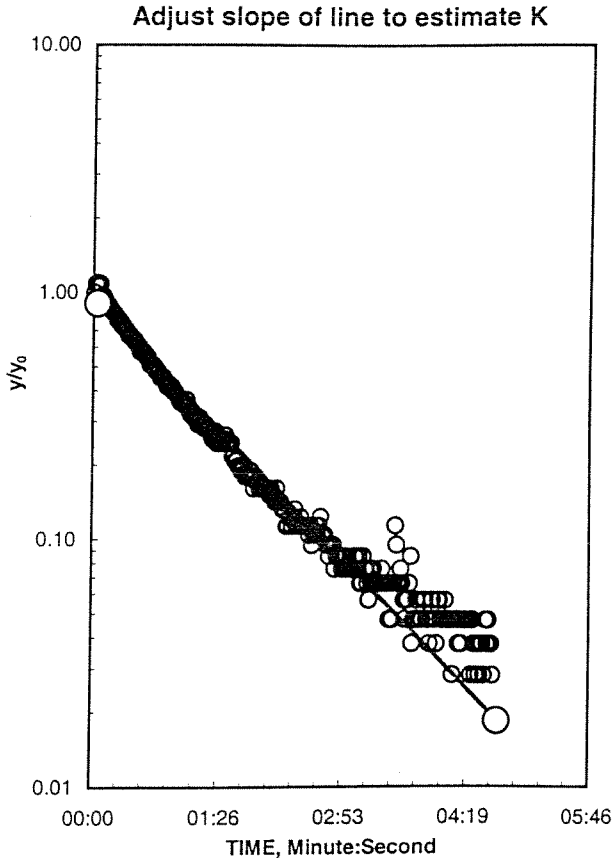
L_{wetted}	5 Feet
D =	39.36 Feet
H =	39.36 Feet
L/r_w =	14.55
$y_{0\text{-DISPLACEMENT}}$ =	1.06 Feet
$y_{0\text{-SLUG}}$ =	1.27 Feet

From look-up table using L/r_w

Fully penetrate C =	1.488
ln(Re/rw) =	2.991
Re =	6.84 Feet
Slope =	0.006049 $\log_{10}$/sec
$t_{90\%}$ recovery =	165 sec

Input is consistent.

K = 2 Feet/Day



REMARKS:

Bouwer and Rice analysis of slug test, WRR 1976

Falling head test.

Figure 7. Results of falling-head slug test for well MW13D.

WELL ID: MS-13D

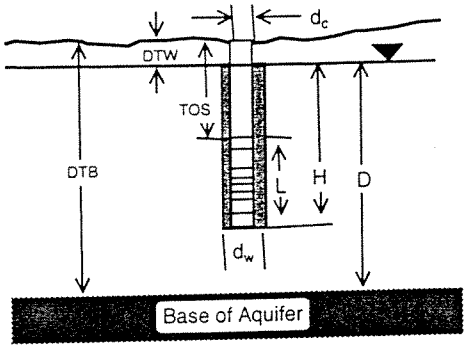
Local ID:

Date: 2/11/2003

Time: 0:00

INPUT

Construction:	
Casing dia. (d_c)	2 Inch
Annulus dia. (d_w)	8.25 Inch
Screen Length (L)	5 Feet
Depths to:	
water level (DTW)	2.64 Feet
top of screen (TOS)	37 Feet
Base of Aquifer (DTB)	42 Feet
Annular Fill:	
across screen --	Medium Sand
above screen --	Bentonite
Aquifer Material --	Surficial Aquifer, centre



COMPUTED

L_{wetted}	5 Feet
D =	39.36 Feet
H =	39.36 Feet
L/r_w =	14.55
$y_{0\text{-DISPLACEMENT}}$ =	1.39 Feet
$y_{0\text{-SLUG}}$ =	1.27 Feet

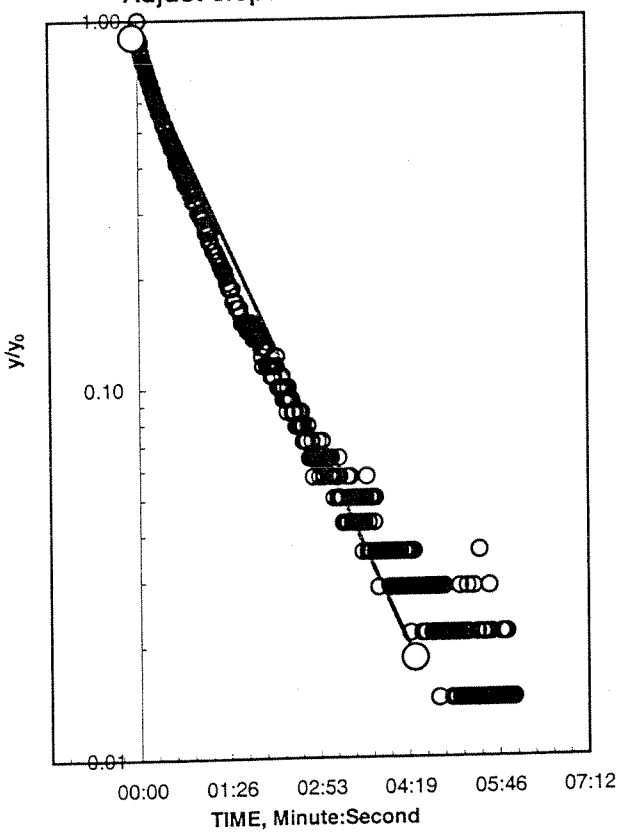
From look-up table using L/r_w

Fully penetrate C =	1.488
ln(Re/rw) =	2.991
Re =	6.84 Feet
Slope =	0.006262 $\log_{10}$/sec
$t_{90\%}$ recovery =	160 sec

Input is consistent.

K = 3 Feet/Day

Adjust slope of line to estimate K



REMARKS: Bouwer and Rice analysis of slug test, WRR 1976

Rising head test.

Figure 8. Results of rising-head slug test for well MW13D.

WELL ID: MS-15S

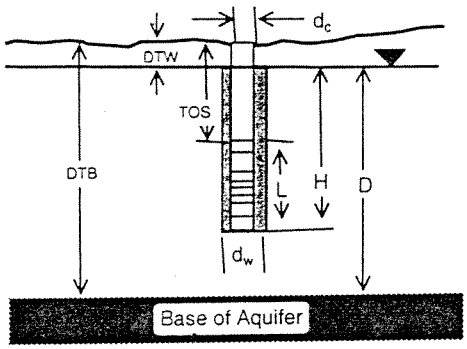
Local ID:

Date: 2/13/2003

Time: 0:00

INPUT

Construction:	
Casing dia. (d_c)	2 Inch
Annulus dia. (d_w)	8.25 Inch
Screen Length (L)	10 Feet
Depths to:	
water level (DTW)	4.04 Feet
top of screen (TOS)	3 Feet
Base of Aquifer (DTB)	13 Feet
Annular Fill:	
across screen --	Medium Sand
above screen --	Backfill
Aquifer Material --	Surficial Aquifer, centra



COMPUTED

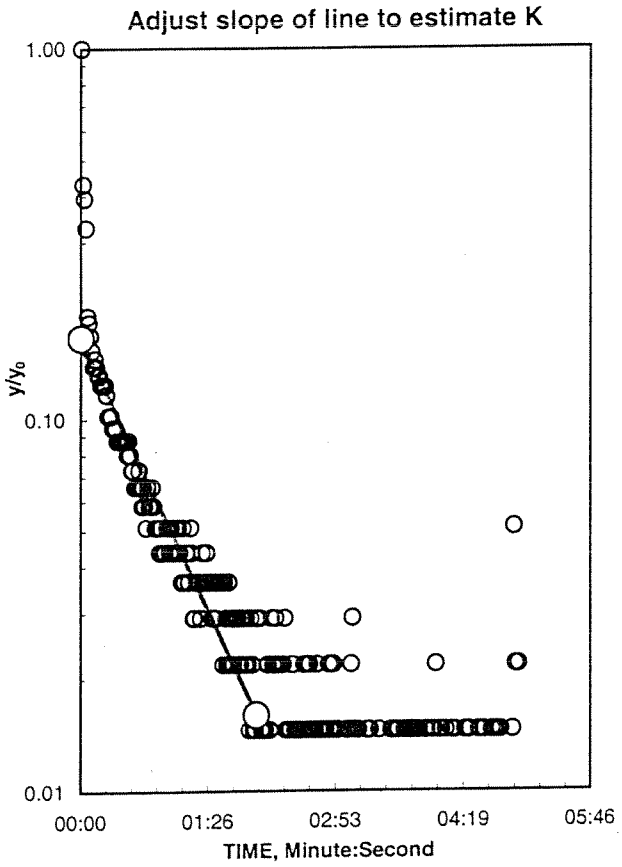
L_{wetted}	8.96 Feet
D =	8.96 Feet
H =	8.96 Feet
L/r_w =	26.07
$y_{0\text{-DISPLACEMENT}}$ =	1.37 Feet
$y_{0\text{-SLUG}}$ =	1.47 Feet

From look-up table using L/r_w

Fully penetrate C =	1.944
ln(Re/rw) =	2.428
Re =	3.89 Feet
Slope =	0.008521 $\log_{10}$/sec
$t_{90\%}$ recovery =	117 sec

Input is consistent.

K = 2 Feet/Day



REMARKS:

Bouwer and Rice analysis of slug test, WRR 1976

Falling head test.

Figure 9. Results of falling-head slug test for well MW15S.

WELL ID: MS-15S

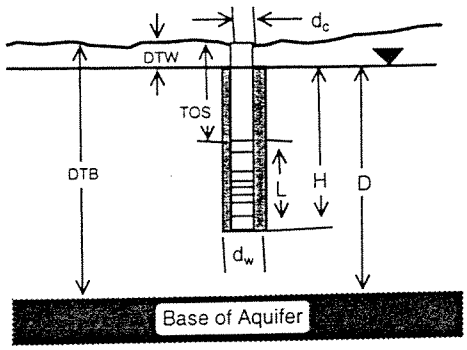
Local ID:

Date: 2/13/2003

Time: 0:00

INPUT

Construction:	
Casing dia. (d_c)	2 Inch
Annulus dia. (d_w)	8.25 Inch
Screen Length (L)	10 Feet
Depths to:	
water level (DTW)	4.04 Feet
top of screen (TOS)	3 Feet
Base of Aquifer (DTB)	13 Feet
Annular Fill:	
across screen --	Medium Sand
above screen --	Backfill
Aquifer Material --	Surficial Aquifer, centr

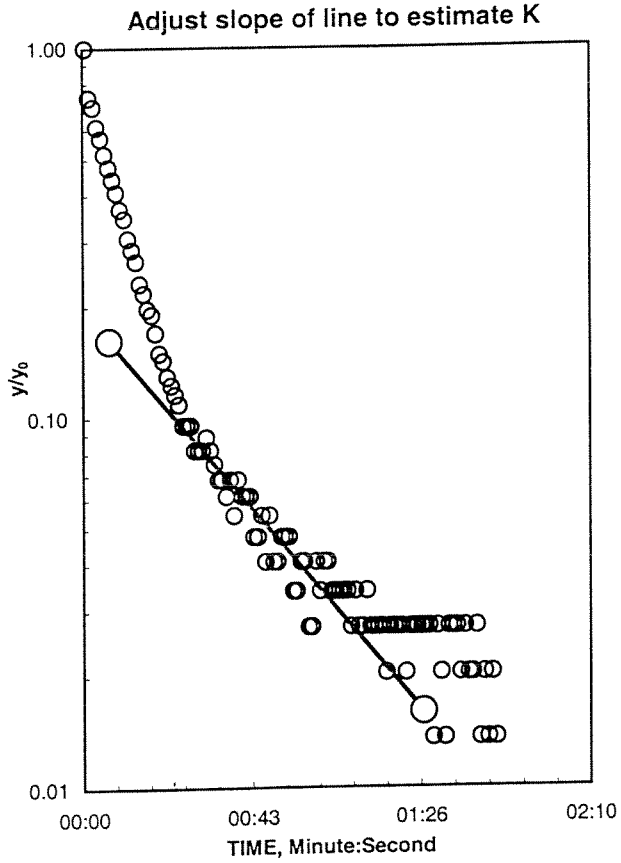


COMPUTED

L_{wetted}	8.96 Feet
D =	8.96 Feet
H =	8.96 Feet
L/r_w =	26.07
$y_{0\text{-DISPLACEMENT}}$ =	1.47 Feet
$y_{0\text{-SLUG}}$ =	1.47 Feet
From look-up table using L/r_w	
Fully penetrate C =	1.944
ln(Re/rw) =	2.428
Re =	3.89 Feet
Slope =	0.012507 $\log_{10}$/sec
$t_{90\%}$ recovery =	80 sec

Input is consistent.

K = 2 Feet/Day



REMARKS:

Bouwer and Rice analysis of slug test, WRR 1976

Rising head test.

Figure 10. Results of rising-head slug test for well MW15S.

WELL ID: MS-15D

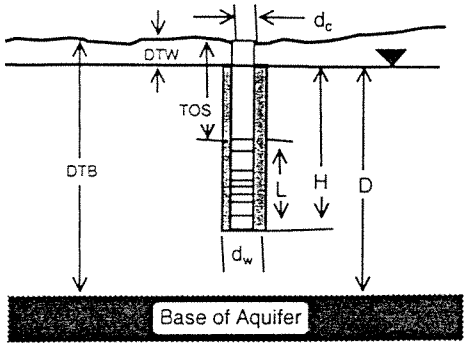
Local ID:

Date: 2/12/2003

Time: 0:00

INPUT

Construction:	
Casing dia. (d_c)	2 Inch
Annulus dia. (d_w)	8.25 Inch
Screen Length (L)	5 Feet
Depths to:	
water level (DTW)	5.76 Feet
top of screen (TOS)	39 Feet
Base of Aquifer (DTB)	44 Feet
Annular Fill:	
across screen --	Medium Sand
above screen --	Bentonite
Aquifer Material --	Surficial Aquifer, centr



COMPUTED

L_{wetted}	5 Feet
D =	38.24 Feet
H =	38.24 Feet
L/r_w =	14.55
$y_{0\text{-DISPLACEMENT}}$ =	1.51 Feet
$y_{0\text{-SLUG}}$ =	1.27 Feet

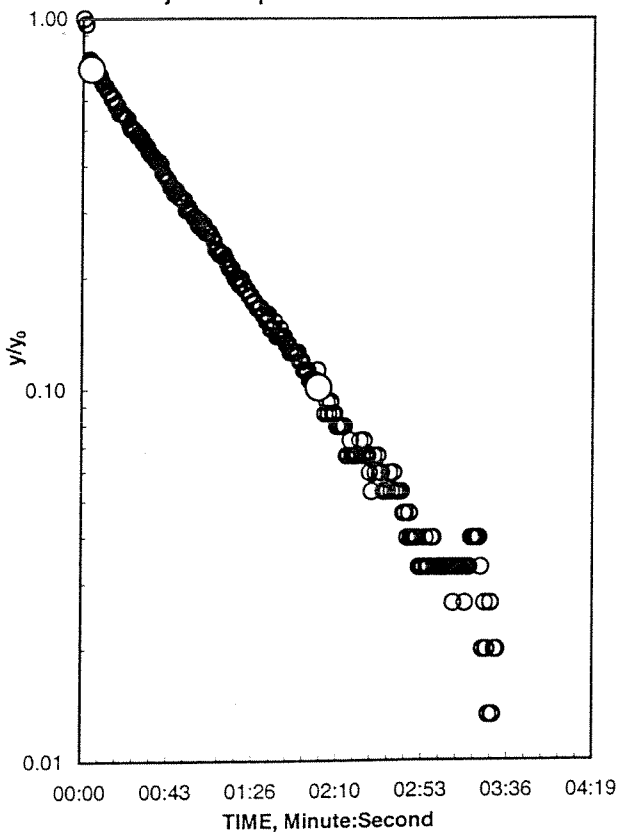
From look-up table using L/r_w

Fully penetrate C =	1.488
ln(Re/rw) =	2.979
Re =	6.76 Feet
Slope =	0.007419 $\log_{10}$/sec
$t_{90\%}$ recovery =	135 sec.

Input is consistent.

K = 3 Feet/Day

Adjust slope of line to estimate K



REMARKS:

Bouwer and Rice analysis of slug test, WRR 1976

Falling head test.

Figure 11. Results of falling-head slug test for well MW15D.

WELL ID: MS-15D

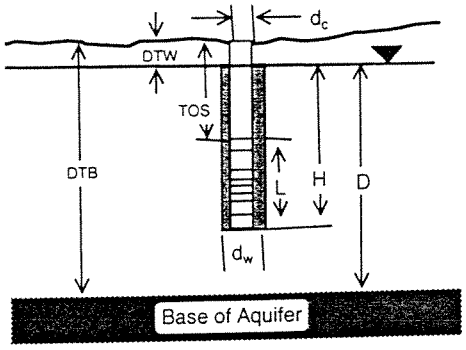
Local ID:

Date: 2/12/2003

Time: 0:00

INPUT

Construction:	
Casing dia. (d_c)	2 Inch
Annulus dia. (d_w)	8.25 Inch
Screen Length (L)	5 Feet
Depths to:	
water level (DTW)	5.76 Feet
top of screen (TOS)	39 Feet
Base of Aquifer (DTB)	44 Feet
Annular Fill:	
across screen --	Medium Sand
above screen --	Bentonite
Aquifer Material --	Surficial Aquifer, centr



COMPUTED

L_{wetted}	5 Feet
D =	38.24 Feet
H =	38.24 Feet
L/r_w =	14.55
$y_{0\text{-DISPLACEMENT}}$ =	1.41 Feet
$y_{0\text{-SLUG}}$ =	1.27 Feet

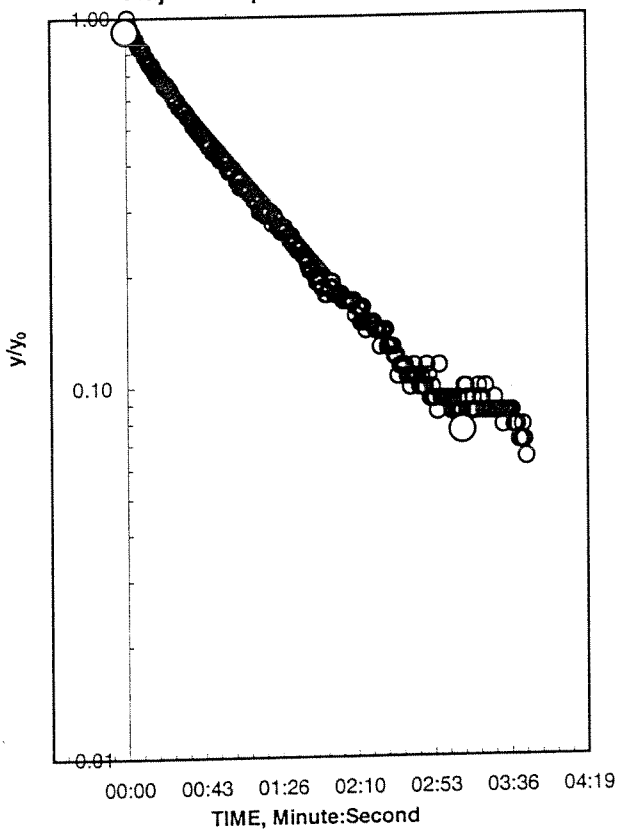
From look-up table using L/r_w

Fully penetrate C =	1.488
ln(Re/rw) =	2.979
Re =	6.76 Feet
Slope =	0.005724 $\log_{10}$/sec
$t_{90\%}$ recovery =	175 sec

Input is consistent.

K = 2 Feet/Day

Adjust slope of line to estimate K



REMARKS:

Bouwer and Rice analysis of slug test, WRR 1976

Rising head test.

Figure 12. Results of rising-head slug test for well MW15D.

WELL ID: MS-16S

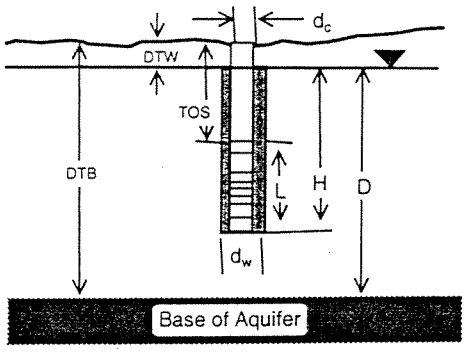
Local ID:

Date: 2/13/2003

Time: 0:00

INPUT

Construction:	
Casing dia. (d_c)	2 Inch
Annulus dia. (d_w)	8.25 Inch
Screen Length (L)	10 Feet
Depths to:	
water level (DTW)	3.23 Feet
top of screen (TOS)	3 Feet
Base of Aquifer (DTB)	13 Feet
Annular Fill:	
across screen --	Medium Sand
above screen --	Bentonite
Aquifer Material --	Surficial Aquifer, centr



COMPUTED

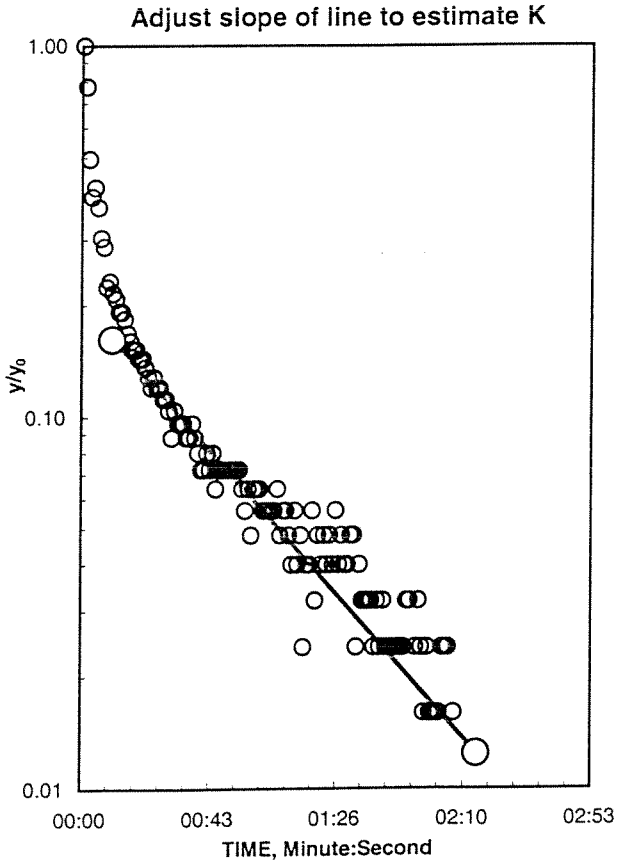
L_{wetted}	9.77 Feet
D =	9.77 Feet
H =	9.77 Feet
L/r_w =	28.42
$y_{0\text{-DISPLACEMENT}}$ =	1.25 Feet
$y_{0\text{-SLUG}}$ =	1.27 Feet

From look-up table using L/r_w

Fully penetrate C =	2.015
ln(Re/rw) =	2.503
Re =	4.20 Feet
Slope =	0.008993 $\log_{10}$/sec
$t_{90\%}$ recovery =	111 sec

Input is consistent.

K = 2 Feet/Day



REMARKS:

Bouwer and Rice analysis of slug test, WRR 1976

Falling head test.

Figure 13. Results of falling-head slug test for well MW16S.

WELL ID: MS-16S

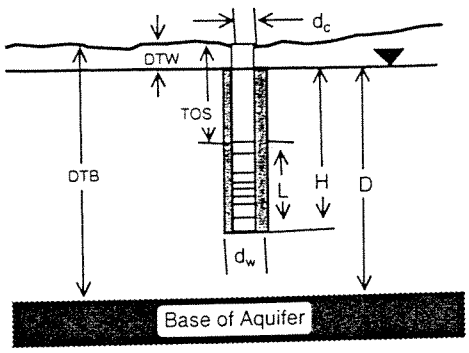
Local ID:

Date: 2/13/2003

Time: 0:00

INPUT

Construction:	
Casing dia. (d_c)	2 Inch
Annulus dia. (d_w)	8.25 Inch
Screen Length (L)	10 Feet
Depths to:	
water level (DTW)	3.23 Feet
top of screen (TOS)	3 Feet
Base of Aquifer (DTB)	13 Feet
Annular Fill:	
across screen --	Medium Sand
above screen --	Bentonite
Aquifer Material --	Surficial Aquifer, centre



COMPUTED

L_{wetted}	9.77 Feet
D =	9.77 Feet
H =	9.77 Feet
L/r_w =	28.42
$y_{0\text{-DISPLACEMENT}}$ =	1.14 Feet
$y_{0\text{-SLUG}}$ =	1.27 Feet

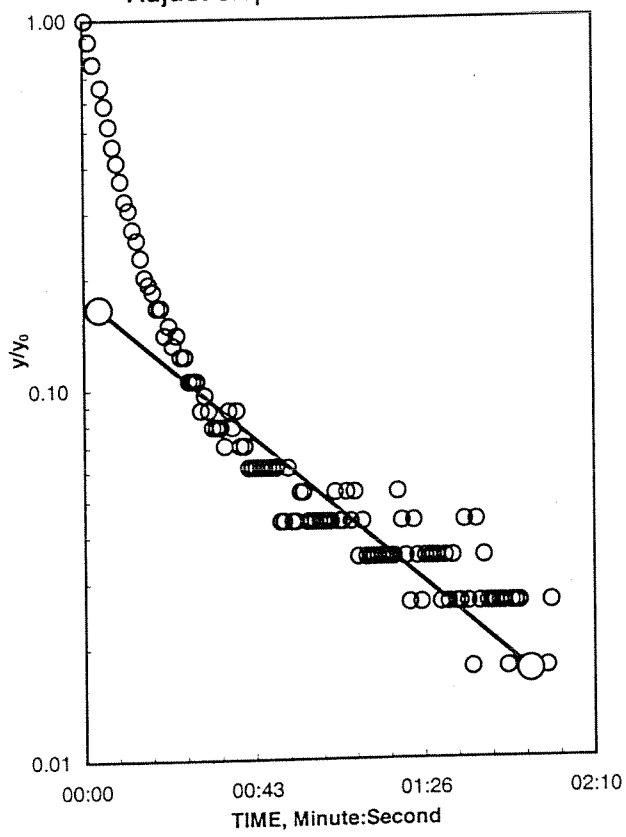
From look-up table using L/r_w

Fully penetrate C =	2.015
ln(Re/rw) =	2.503
Re =	4.20 Feet
Slope =	0.008996 $\log_{10}$/sec
$t_{90\%}$ recovery =	111 sec

Input is consistent.

K = 2 Feet/Day

Adjust slope of line to estimate K



REMARKS: Bouwer and Rice analysis of slug test, WRR 1976

Rising head test.

Figure 14. Results of rising-head slug test for well MW16S.

WELL ID: MS-16D

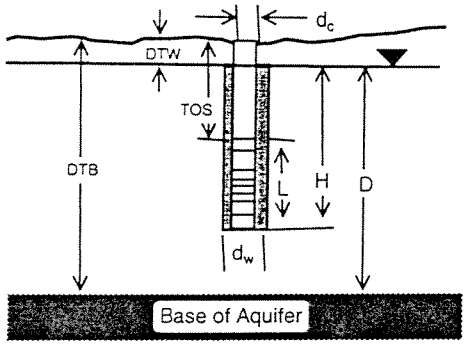
Local ID:

Date: 2/11/2003

Time: 0:00

INPUT

Construction:	
Casing dia. (d_c)	2 Inch
Annulus dia. (d_w)	8.25 Inch
Screen Length (L)	5 Feet
Depths to:	
water level (DTW)	3.7 Feet
top of screen (TOS)	36.5 Feet
Base of Aquifer (DTB)	41.5 Feet
Annular Fill:	
across screen -- Medium Sand	
above screen -- Bentonite	
Aquifer Material -- Surficial Aquifer, centr	

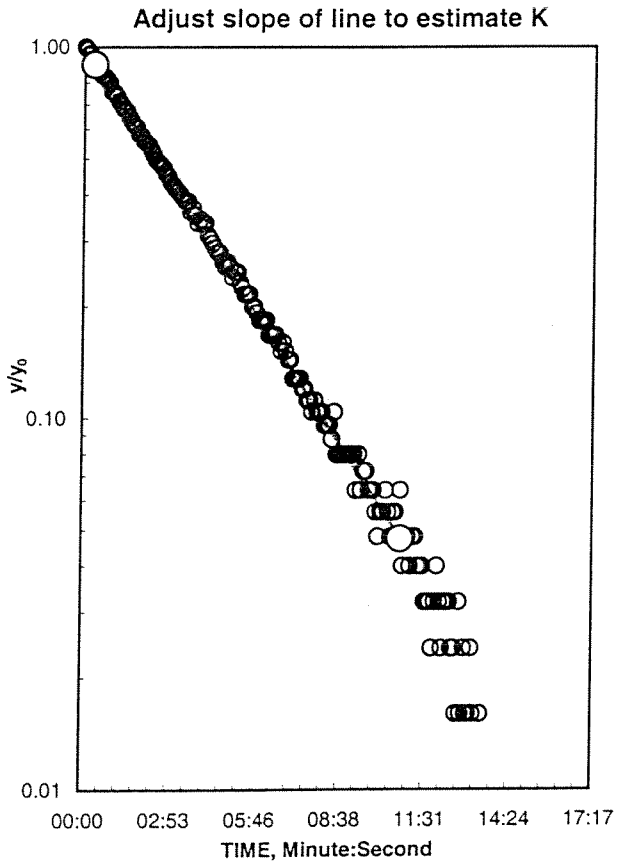


COMPUTED

L_{wetted}	5 Feet
D =	37.8 Feet
H =	37.8 Feet
L/r_w =	14.55
$y_{0\text{-DISPLACEMENT}}$ =	1.25 Feet
$y_{0\text{-SLUG}}$ =	1.27 Feet
From look-up table using L/r_w	
Fully penetrate C =	1.488
ln(Re/rw) =	2.973
Re =	6.72 Feet
Slope =	0.002043 $\log_{10}$/sec
$t_{90\%}$ recovery =	489 sec

Input is consistent.

K = 0.8 Feet/Day



REMARKS:

Bouwer and Rice analysis of slug test, WRR 1976

Falling head test.

Figure 15. Results of falling-head slug test for well MW16D.

WELL ID: MS-16D

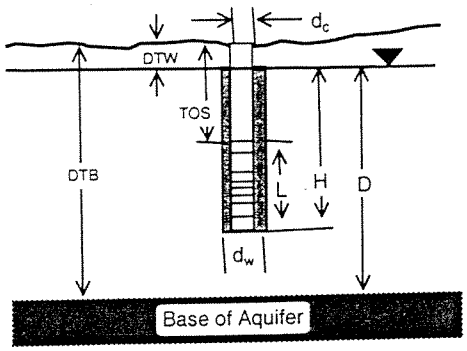
Local ID:

Date: 2/11/2003

Time: 0:00

INPUT

Construction:	
Casing dia. (d_c)	2 Inch
Annulus dia. (d_w)	8.25 Inch
Screen Length (L)	5 Feet
Depths to:	
water level (DTW)	3.7 Feet
top of screen (TOS)	36.5 Feet
Base of Aquifer (DTB)	41.5 Feet
Annular Fill:	
across screen --	Medium Sand
above screen --	Bentonite
Aquifer Material --	Surficial Aquifer, centr



COMPUTED

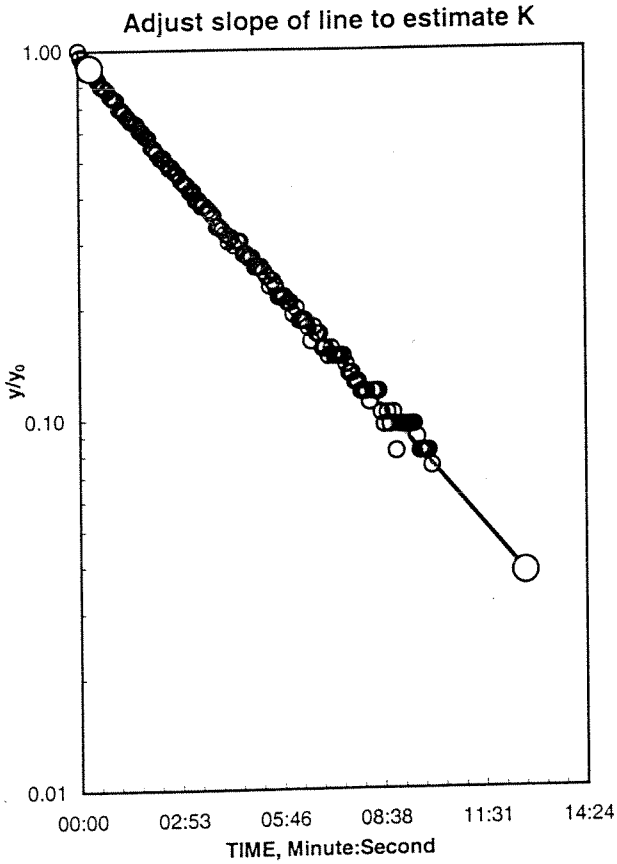
L_{wetted}	5 Feet
D =	37.8 Feet
H =	37.8 Feet
L/r_w =	14.55
$y_{0\text{-DISPLACEMENT}}$ =	1.35 Feet
$y_{0\text{-SLUG}}$ =	1.27 Feet

From look-up table using L/r_w

Fully penetrate C =	1.488
ln(Re/rw) =	2.973
Re =	6.72 Feet
Slope =	0.001857 $\log_{10}$/sec
$t_{90\%}$ recovery =	538 sec

Input is consistent.

K = 0.8 Feet/Day



REMARKS:

Bouwer and Rice analysis of slug test, WRR 1976

Rising head test.

Figure 16. Results of rising-head slug test for well MW16D.

WELL ID: MS-17S

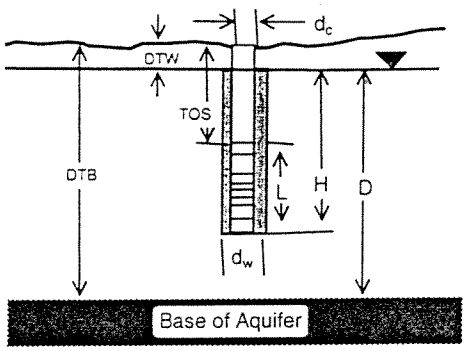
Local ID:

Date: 2/13/2003

Time: 0:00

INPUT

Construction:	
Casing dia. (d_c)	2 Inch
Annulus dia. (d_w)	8.25 Inch
Screen Length (L)	10 Feet
Depths to:	
water level (DTW)	2.08 Feet
top of screen (TOS)	2.5 Feet
Base of Aquifer (DTB)	12.5 Feet
Annular Fill:	
across screen --	Medium Sand
above screen --	Backfill
Aquifer Material --	Surficial Aquifer, centr

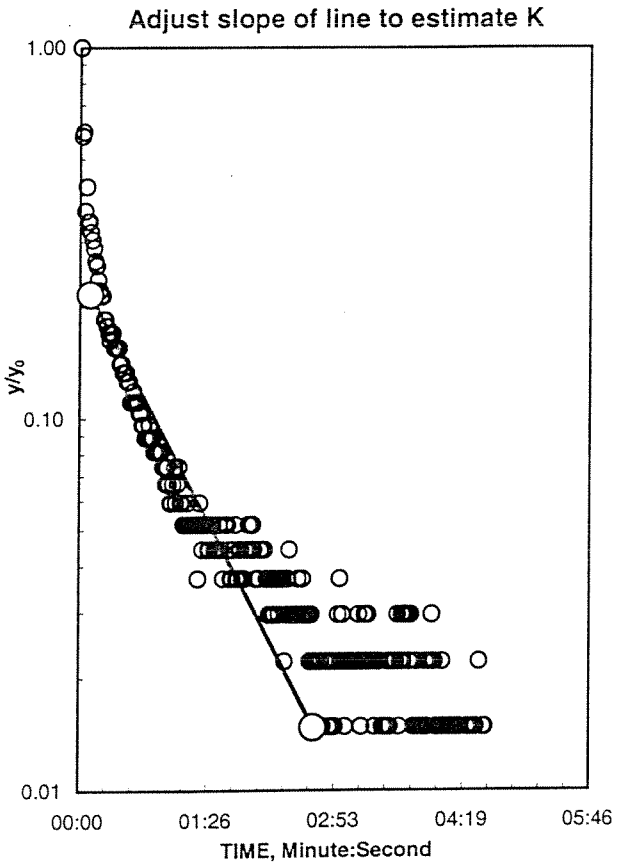


COMPUTED

L_{wetted}	10 Feet
D =	10.42 Feet
H =	10.42 Feet
L/r_w =	29.09
$y_{0\text{-DISPLACEMENT}}$ =	1.35 Feet
$y_{0\text{-SLUG}}$ =	1.27 Feet
From look-up table using L/r_w	
Fully penetrate C =	2.041
ln(Re/rw) =	2.547
Re =	4.39 Feet
Slope =	0.007674 $\log_{10}$/sec
$t_{90\%}$ recovery =	130 sec

Input is consistent.

K = 1 Feet/Day



REMARKS:

Bouwer and Rice analysis of slug test, WRR 1976

Falling head test.

Figure 17. Results of falling-head slug test for well MW17S.

WELL ID: MS-17S

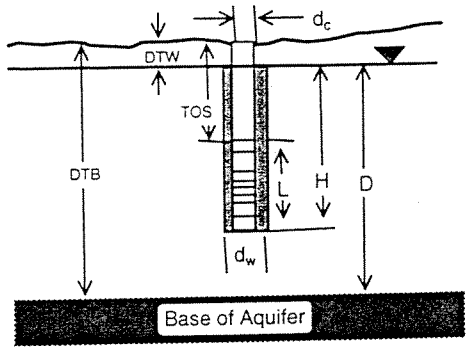
Local ID:

Date: 2/13/2003

Time: 0:00

INPUT

Construction:	
Casing dia. (d_c)	2 Inch
Annulus dia. (d_w)	8.25 Inch
Screen Length (L)	10 Feet
Depths to:	
water level (DTW)	2.08 Feet
top of screen (TOS)	2.5 Feet
Base of Aquifer (DTB)	12.5 Feet
Annular Fill:	
across screen --	Medium Sand
above screen --	Backfill
Aquifer Material --	Surficial Aquifer, centr



COMPUTED

L_{wetted}	10 Feet
D =	10.42 Feet
H =	10.42 Feet
L/r_w =	29.09
$y_{0\text{-DISPLACEMENT}}$ =	1.22 Feet
$y_{0\text{-SLUG}}$ =	1.27 Feet

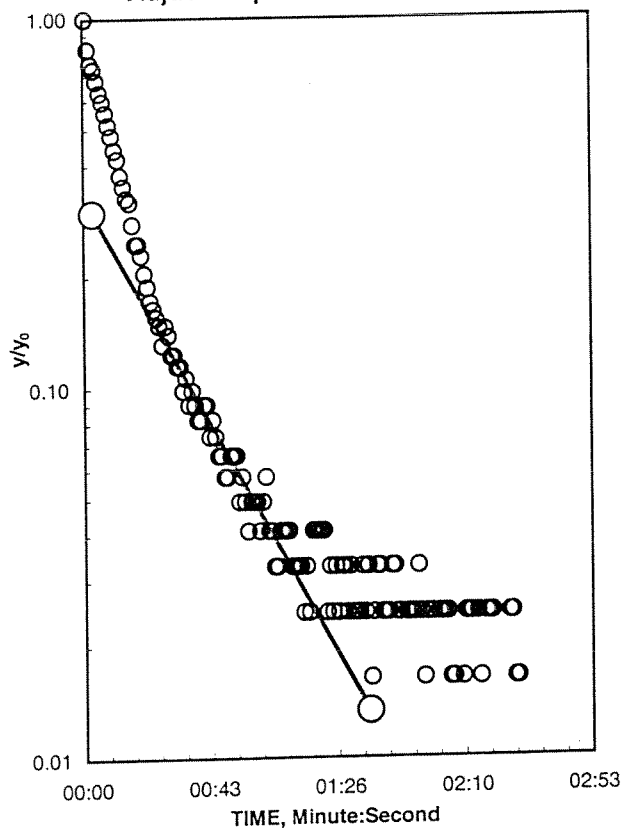
From look-up table using L/r_w

Fully penetrate C =	2.041
ln(Re/rw) =	2.547
Re =	4.39 Feet
Slope =	0.014361 $\log_{10}$/sec
$t_{90\%}$ recovery =	70 sec

Input is consistent.

K = 3 Feet/Day

Adjust slope of line to estimate K



REMARKS: Bouwer and Rice analysis of slug test, WRR 1976

Rising head test.

Figure 18. Results of rising-head slug test for well MW17S.

WELL ID: MS-17D

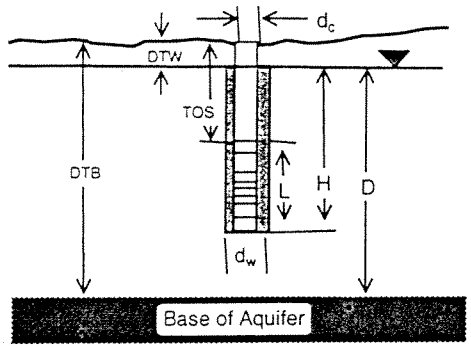
Local ID:

Date: 2/11/2003

Time: 0:00

INPUT

Construction:	
Casing dia. (d_c)	2 Inch
Annulus dia. (d_w)	8.25 Inch
Screen Length (L)	5 Feet
Depths to:	
water level (DTW)	2.64 Feet
top of screen (TOS)	37 Feet
Base of Aquifer (DTB)	42 Feet
Annular Fill:	
across screen --	Medium Sand
above screen --	Bentonite
Aquifer Material --	Surficial Aquifer, centre



COMPUTED

L_{wetted}	5 Feet
D =	39.36 Feet
H =	39.36 Feet
L/r_w =	14.55
$y_{0\text{-DISPLACEMENT}}$ =	1.25 Feet
$y_{0\text{-SLUG}}$ =	1.27 Feet

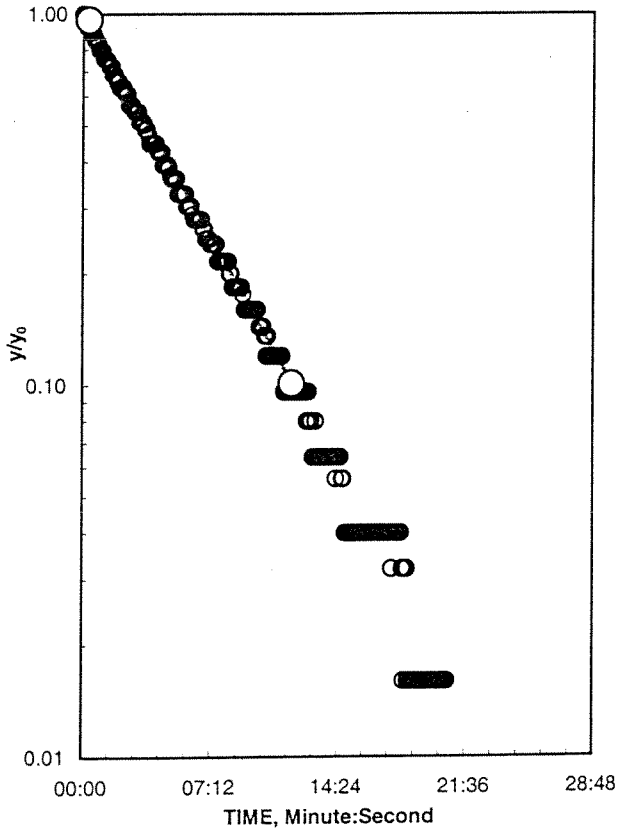
From look-up table using L/r_w

Fully penetrate C =	1.488
ln(Re/rw) =	2.991
Re =	6.84 Feet
Slope =	0.001423 $\log_{10}$/sec
$t_{90\%}$ recovery =	702 sec

Input is consistent.

K = 0.6 Feet/Day

Adjust slope of line to estimate K



REMARKS:

Bouwer and Rice analysis of slug test, WRR 1976

Falling head test.

Figure 19. Results of falling-head slug test for well MW17D.

WELL ID: MS-17D

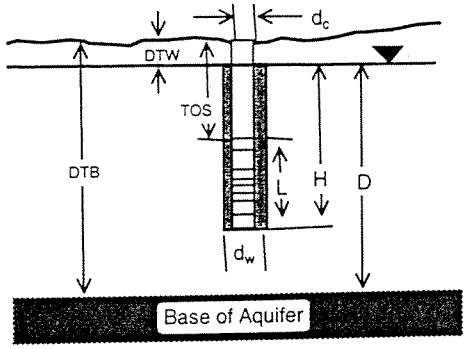
Local ID:

Date: 2/11/2003

Time: 0:00

INPUT

Construction:	
Casing dia. (d_c)	2 Inch
Annulus dia. (d_w)	8.25 Inch
Screen Length (L)	5 Feet
Depths to:	
water level (DTW)	2.64 Feet
top of screen (TOS)	37 Feet
Base of Aquifer (DTB)	42 Feet
Annular Fill:	
across screen --	Medium Sand
above screen --	Bentonite
Aquifer Material --	Surficial Aquifer, centre



COMPUTED

L_{wetted}	5 Feet
D =	39.36 Feet
H =	39.36 Feet
L/r_w =	14.55
$y_{0\text{-DISPLACEMENT}}$ =	1.33 Feet
$y_{0\text{-SLUG}}$ =	1.27 Feet

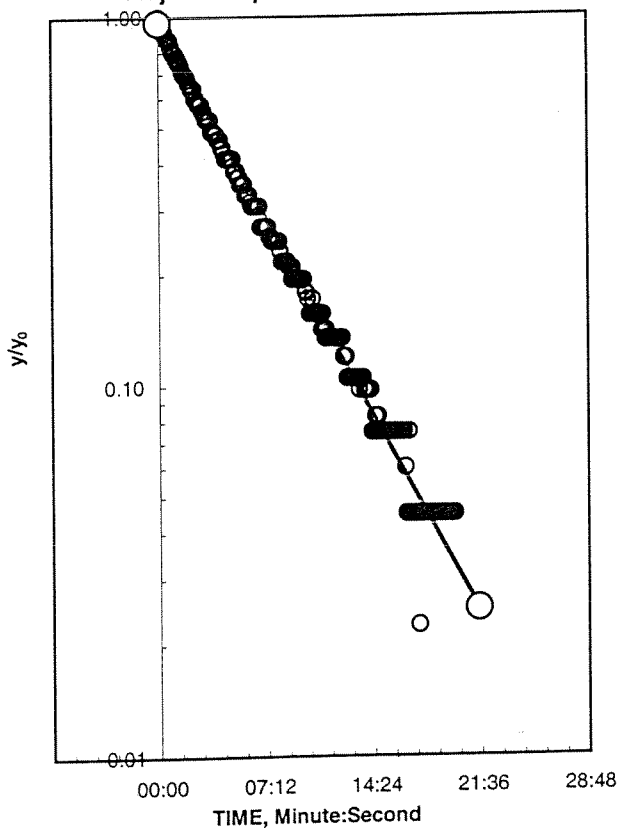
From look-up table using L/r_w

Fully penetrate C =	1.488
ln(Re/rw) =	2.991
Re =	6.84 Feet
Slope =	0.001234 $\log_{10}$/sec
$t_{90\%}$ recovery =	811 sec

Input is consistent.

K = 0.5 Feet/Day

Adjust slope of line to estimate K



Bouwer and Rice analysis of slug test, WRR 1976

REMARKS:

Rising head test.

Figure 20. Results of rising-head slug test for well MW17D.

WELL ID: MS-18S

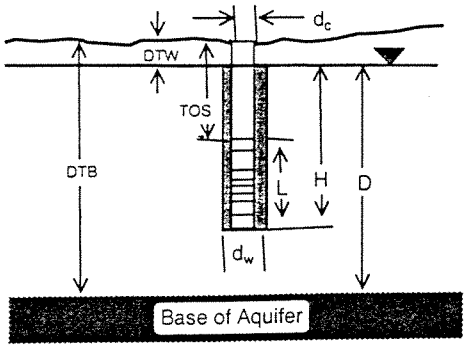
Local ID:

Date: 2/13/2003

Time: 0:00

INPUT

Construction:	
Casing dia. (d_c)	2 Inch
Annulus dia. (d_w)	8.25 Inch
Screen Length (L)	10 Feet
Depths to:	
water level (DTW)	4.16 Feet
top of screen (TOS)	4 Feet
Base of Aquifer (DTB)	14 Feet
Annular Fill:	
across screen --	Medium Sand
above screen --	Backfill
Aquifer Material --	Surficial Aquifer, centre



COMPUTED

L_{wetted}	9.84 Feet
D =	9.84 Feet
H =	9.84 Feet
L/r_w =	28.63
$y_{0\text{-DISPLACEMENT}}$ =	1.12 Feet
$y_{0\text{-SLUG}}$ =	1.27 Feet

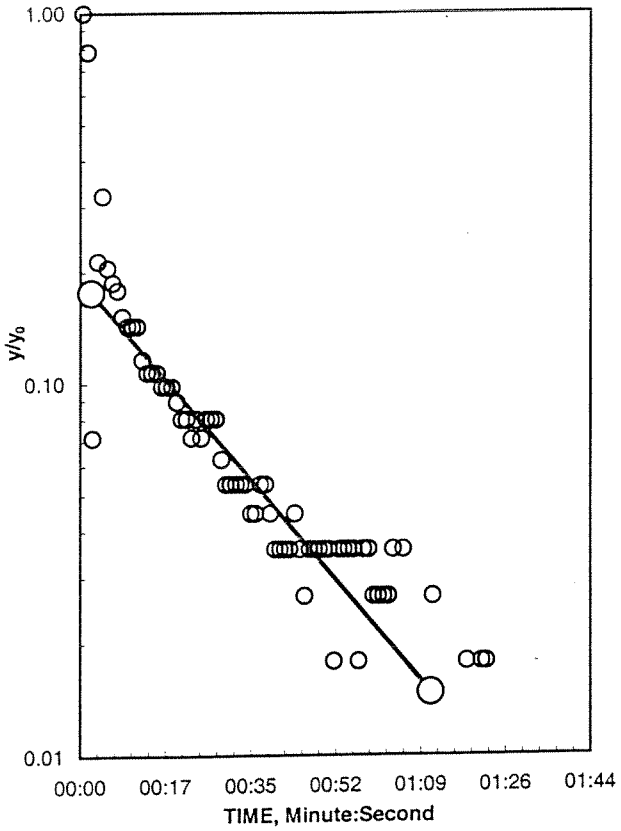
From look-up table using L/r_w

Fully penetrate C =	2.021
ln(Re/rw) =	2.509
Re =	4.23 Feet
Slope =	0.015635 $\log_{10}$/sec
$t_{90\%}$ recovery =	64 sec

Input is consistent.

K = 3 Feet/Day

Adjust slope of line to estimate K



REMARKS:

Bouwer and Rice analysis of slug test, WRR 1976

Falling head test.

Figure 21. Results of falling-head slug test for well MW18S.

WELL ID: MS-18S

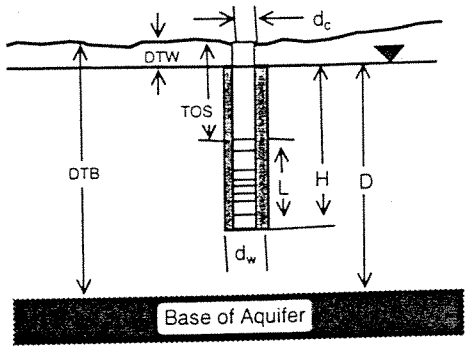
Local ID:

Date: 2/13/2003

Time: 0:00

INPUT

Construction:	
Casing dia. (d_c)	2 Inch
Annulus dia. (d_w)	8.25 Inch
Screen Length (L)	10 Feet
Depths to:	
water level (DTW)	4.16 Feet
top of screen (TOS)	4 Feet
Base of Aquifer (DTB)	14 Feet
Annular Fill:	
across screen --	Medium Sand
above screen --	Backfill
Aquifer Material --	Surficial Aquifer, centr



COMPUTED

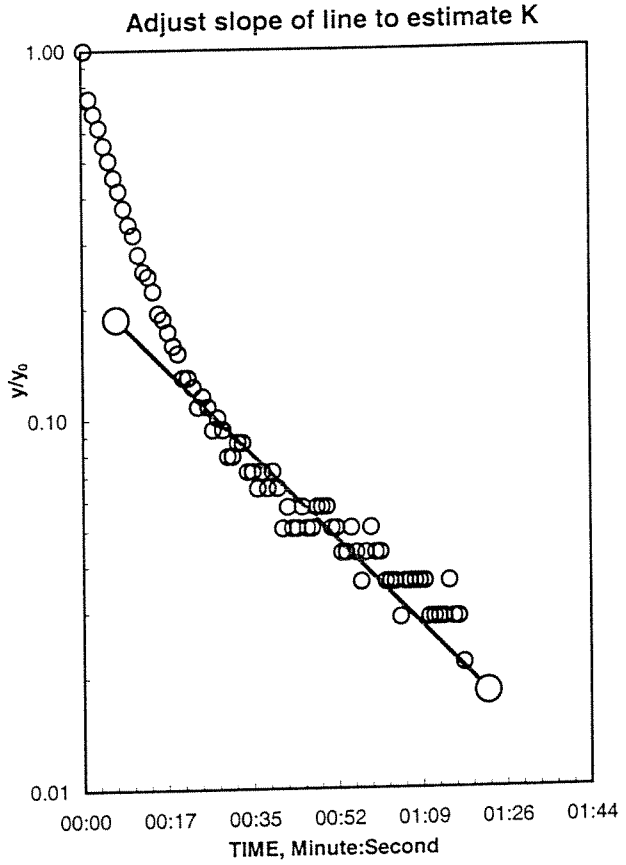
L_{wetted}	9.84 Feet
D =	9.84 Feet
H =	9.84 Feet
L/r_w =	28.63
$y_{0\text{-DISPLACEMENT}}$ =	1.39 Feet
$y_{0\text{-SLUG}}$ =	1.27 Feet

From look-up table using L/r_w

Fully penetrate C =	2.021
ln(Re/rw) =	2.509
Re =	4.23 Feet
Slope =	0.013441 $\log_{10}$/sec
$t_{90\%}$ recovery =	74 sec

Input is consistent.

K = 2 Feet/Day



REMARKS:

Bouwer and Rice analysis of slug test, WRR 1976

Rising head test.

Figure 22. Results of rising-head slug test for well MW18S.

WELL ID: MS-18D

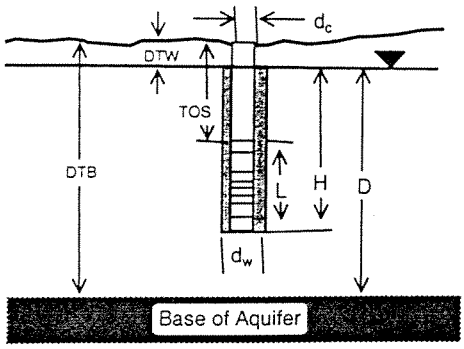
Local ID:

Date: 2/12/2003

Time: 0:00

INPUT

Construction:	
Casing dia. (d_c)	2 Inch
Annulus dia. (d_w)	8.25 Inch
Screen Length (L)	5 Feet
Depths to:	
water level (DTW)	4.63 Feet
top of screen (TOS)	39 Feet
Base of Aquifer (DTB)	44 Feet
Annular Fill:	
across screen --	Medium Sand
above screen --	Bentonite
Aquifer Material --	Surficial Aquifer, centr



COMPUTED

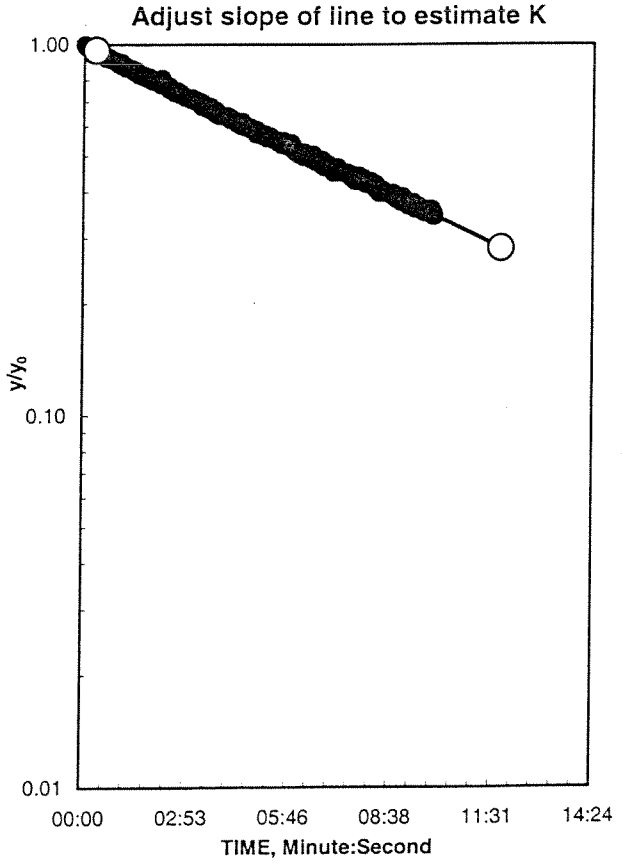
L_{wetted}	5 Feet
D =	39.37 Feet
H =	39.37 Feet
L/r_w =	14.55
$y_{0\text{-DISPLACEMENT}}$ =	1.31 Feet
$y_{0\text{-SLUG}}$ =	1.27 Feet

From look-up table using L/r_w

Fully penetrate C =	1.488
ln(Re/rw) =	2.991
Re =	6.84 Feet
Slope =	0.000776 $\log_{10}$/sec
$t_{90\%}$ recovery =	1288 sec

Input is consistent.

K = 0.3 Feet/Day



REMARKS:

Bouwer and Rice analysis of slug test, WRR 1976

Falling head test.

Figure 23. Results of falling-head slug test for well MW18D.

WELL ID: MS-18D

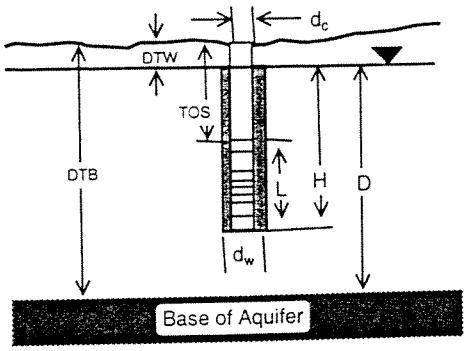
Local ID:

Date: 2/12/2003

Time: 0:00

INPUT

Construction:	
Casing dia. (d_c)	2 Inch
Annulus dia. (d_w)	8.25 Inch
Screen Length (L)	5 Feet
Depths to:	
water level (DTW)	4.63 Feet
top of screen (TOS)	39 Feet
Base of Aquifer (DTB)	44 Feet
Annular Fill:	
across screen --	Medium Sand
above screen --	Bentonite
Aquifer Material --	Surficial Aquifer, centr

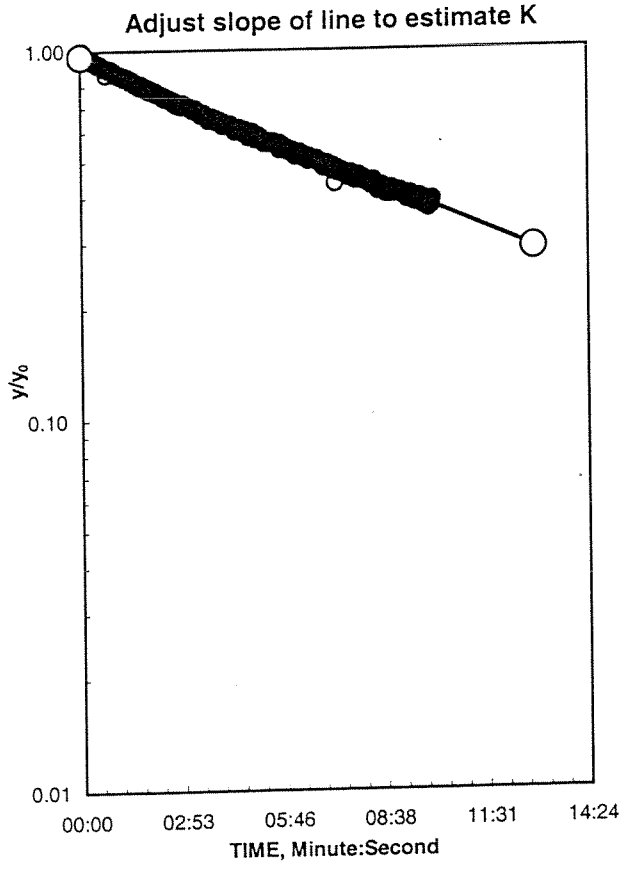


COMPUTED

L_{wetted}	5 Feet
D =	39.37 Feet
H =	39.37 Feet
L/r_w =	14.55
$y_{0\text{-DISPLACEMENT}}$ =	1.38 Feet
$y_{0\text{-SLUG}}$ =	1.27 Feet
From look-up table using L/r_w	
Fully penetrate C =	1.488
ln(Re/rw) =	2.991
Re =	6.84 Feet
Slope =	0.000679 $\log_{10}$/sec
$t_{90\%}$ recovery =	1474 sec

Input is consistent.

K = 0.3 Feet/Day



REMARKS: Bouwer and Rice analysis of slug test, WRR 1976

Rising head test.

Figure 24. Results of rising-head slug test for well MW18D.

WELL ID: MS-19S

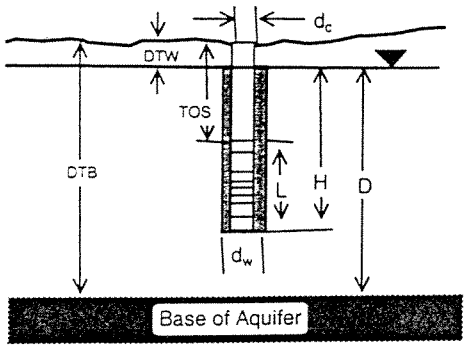
Local ID:

Date: 2/13/2003

Time: 0:00

INPUT

Construction:	
Casing dia. (d_c)	2 Inch
Annulus dia. (d_w)	8.25 Inch
Screen Length (L)	10 Feet
Depths to:	
water level (DTW)	1.83 Feet
top of screen (TOS)	2.5 Feet
Base of Aquifer (DTB)	12.5 Feet
Annular Fill:	
across screen --	Medium Sand
above screen --	Backfill
Aquifer Material --	Surficial Aquifer, centre



COMPUTED

L_{wetted}	10 Feet
D =	10.67 Feet
H =	10.67 Feet
L/r_w =	29.09
$y_{0\text{-DISPLACEMENT}}$ =	1.26 Feet
$y_{0\text{-SLUG}}$ =	1.27 Feet

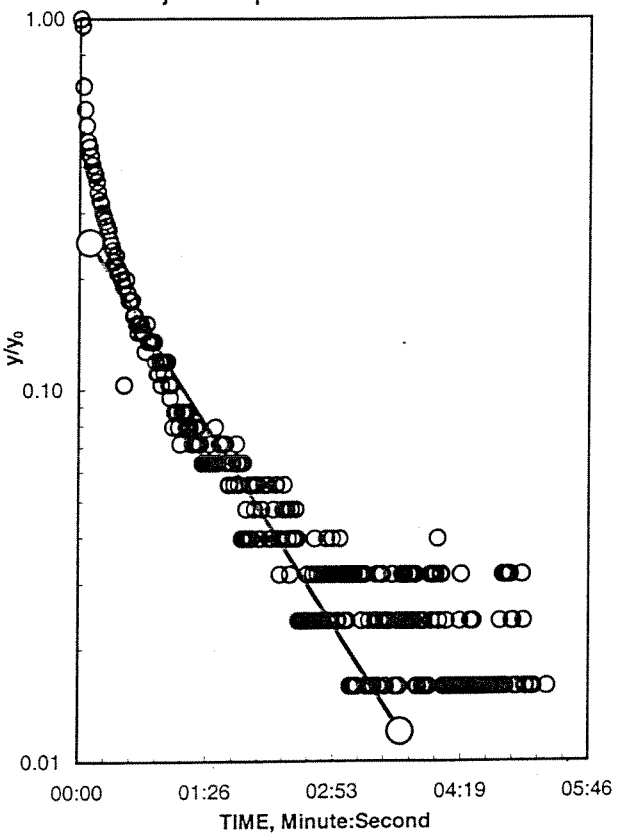
From look-up table using L/r_w

Fully penetrate C =	2.041
ln(Re/rw) =	2.562
Re =	4.45 Feet
Slope =	0.006231 $\log_{10}$/sec
$t_{90\%}$ recovery =	160 sec

Input is consistent.

K = 1 Feet/Day

Adjust slope of line to estimate K



REMARKS:

Bouwer and Rice analysis of slug test, WRR 1976

Falling head test.

Figure 25. Results of falling-head slug test for well MW19S.

WELL ID: MS-19S

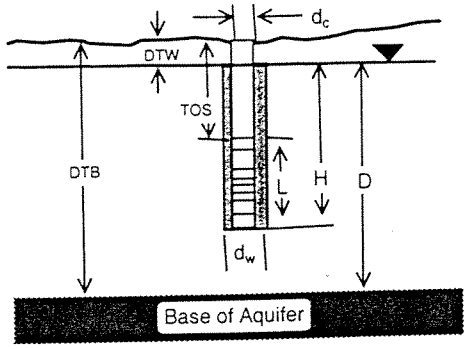
Local ID:

Date: 2/13/2003

Time: 0:00

INPUT

Construction:	
Casing dia. (d_c)	2 Inch
Annulus dia. (d_w)	8.25 Inch
Screen Length (L)	10 Feet
Depths to:	
water level (DTW)	1.83 Feet
top of screen (TOS)	2.5 Feet
Base of Aquifer (DTB)	12.5 Feet
Annular Fill:	
across screen --	Medium Sand
above screen --	Backfill
Aquifer Material --	Surficial Aquifer, centr



COMPUTED

L_{wetted}	10 Feet
D =	10.67 Feet
H =	10.67 Feet
L/r_w =	29.09
$y_{0\text{-DISPLACEMENT}}$ =	0.88 Feet
$y_{0\text{-SLUG}}$ =	1.27 Feet

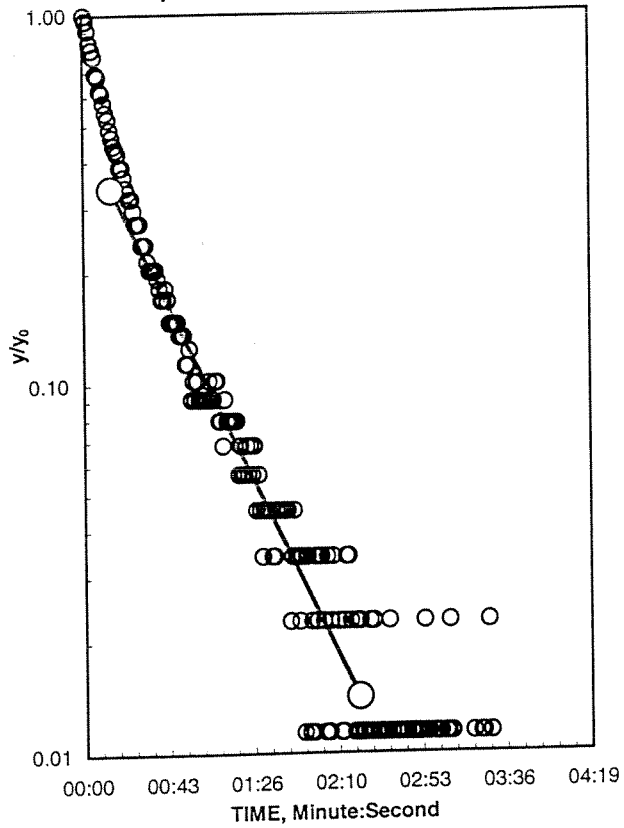
From look-up table using L/r_w

Fully penetrate C =	2.041
ln(Re/rw) =	2.562
Re =	4.45 Feet
Slope =	0.010916 $\log_{10}$/sec
$t_{90\%}$ recovery =	92 sec

Slug discrepancy of 36% is greater than maximum of 20%

K = Error Feet/Day

Adjust slope of line to estimate K



REMARKS:

Bouwer and Rice analysis of slug test, WRR 1976

Rising head test.

Figure 26. Results of rising-head slug test for well MW19S.

WELL ID: MW-20I

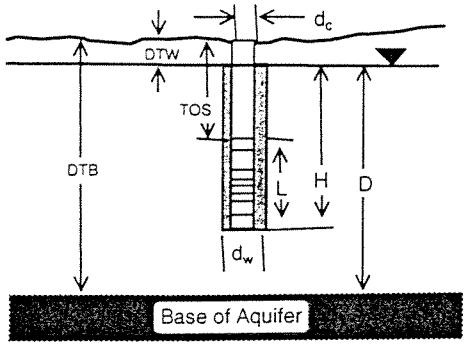
Local ID:

Date: 2/12/2003

Time: 0:00

INPUT

Construction:	
Casing dia. (d_c)	2 Inch
Annulus dia. (d_w)	8.25 Inch
Screen Length (L)	5 Feet
Depths to:	
water level (DTW)	2.83 Feet
top of screen (TOS)	20 Feet
Base of Aquifer (DTB)	25 Feet
Annular Fill:	
across screen --	Medium Sand
above screen --	Bentonite
Aquifer Material --	Surficial Aquifer, centre



COMPUTED

L_{wetted}	5 Feet
D =	22.17 Feet
H =	22.17 Feet
L/r_w =	14.55
$y_{0\text{-DISPLACEMENT}}$ =	1.13 Feet
$y_{0\text{-SLUG}}$ =	1.27 Feet

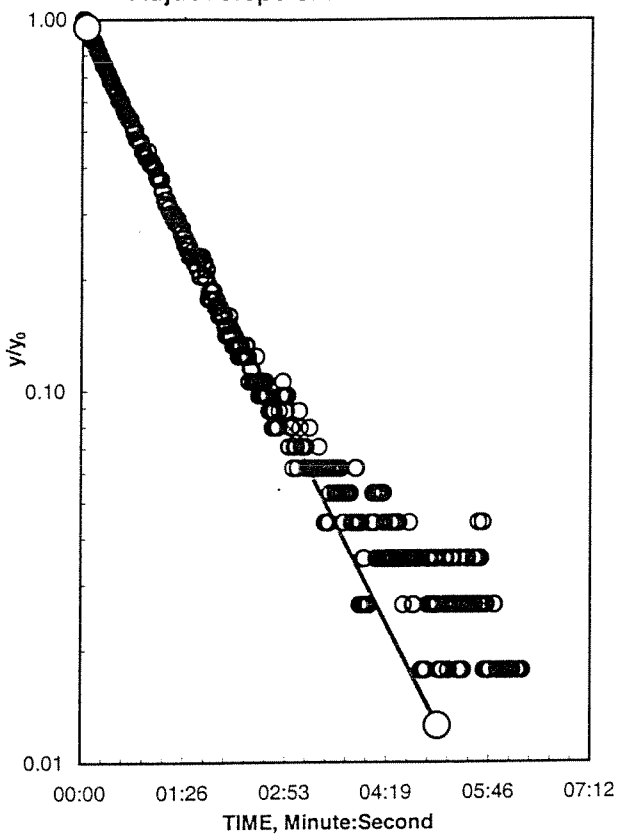
From look-up table using L/r_w

Fully penetrate C =	1.488
ln(Re/rw) =	2.730
Re =	5.27 Feet
Slope =	0.006289 $\log_{10}$/sec
$t_{90\%}$ recovery =	159 sec

Input is consistent.

K = 2 Feet/Day

Adjust slope of line to estimate K



REMARKS: Bouwer and Rice analysis of slug test, WRR 1976

Falling head test.

Figure 27. Results of falling-head slug test for well MW20I.

WELL ID: MW-20I

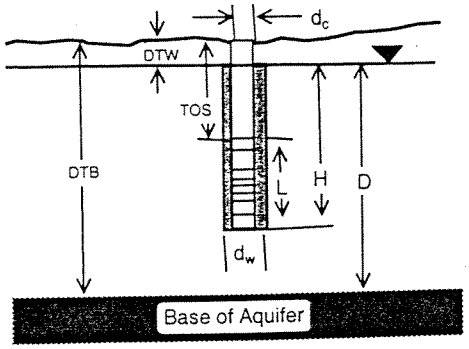
Local ID:

Date: 2/12/2003

Time: 0:00

INPUT

Construction:	
Casing dia. (d_c)	2 Inch
Annulus dia. (d_w)	8.25 Inch
Screen Length (L)	5 Feet
Depths to:	
water level (DTW)	2.83 Feet
top of screen (TOS)	20 Feet
Base of Aquifer (DTB)	25 Feet
Annular Fill:	
across screen --	Medium Sand
above screen --	Bentonite
Aquifer Material --	Surficial Aquifer, centra



COMPUTED

L_{wetted}	5 Feet
D =	22.17 Feet
H =	22.17 Feet
L/r_w =	14.55
$y_{0\text{-DISPLACEMENT}}$ =	1.36 Feet
$y_{0\text{-SLUG}}$ =	1.27 Feet

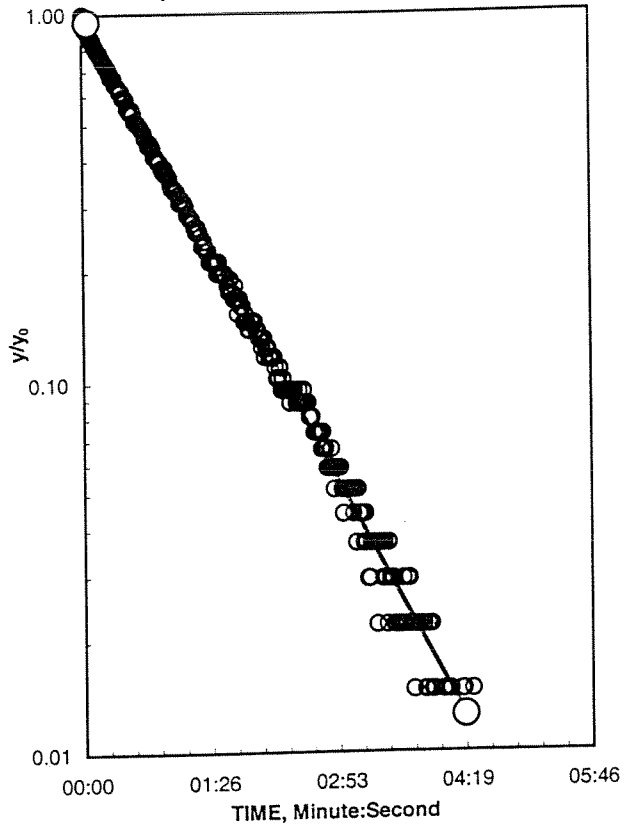
From look-up table using L/r_w

Fully penetrate C =	1.488
ln(Re/rw) =	2.730
Re =	5.27 Feet
Slope =	0.007376 log_{10}/sec
$t_{90\%}$ recovery =	136 sec

Input is consistent.

K = 3 Feet/Day

Adjust slope of line to estimate K



REMARKS: Bouwer and Rice analysis of slug test, WRR 1976

Rising head test.

Figure 28. Results of rising-head slug test for well MW20I.

WELL ID: MS-23

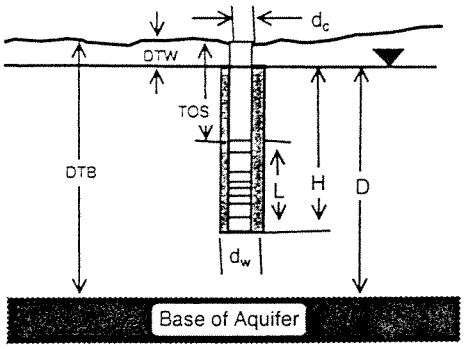
Local ID:

Date: 2/13/2003

Time: 0:00

INPUT

Construction:	
Casing dia. (d_c)	2 Inch
Annulus dia. (d_w)	8.25 Inch
Screen Length (L)	10 Feet
Depths to:	
water level (DTW)	3.67 Feet
top of screen (TOS)	5 Feet
Base of Aquifer (DTB)	15 Feet
Annular Fill:	
across screen --	Medium Sand
above screen --	Backfill
Aquifer Material --	Surficial Aquifer, centr



COMPUTED

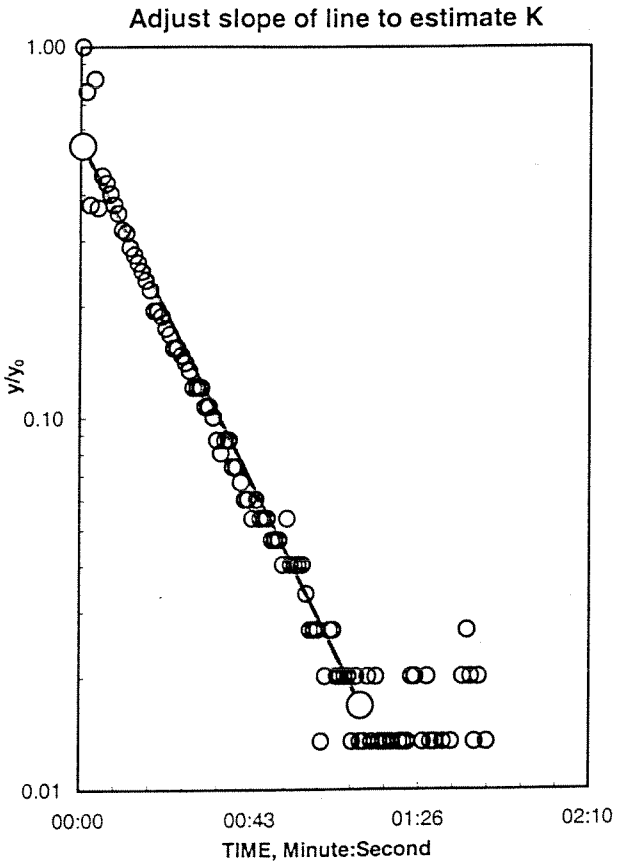
L_{wetted}	10 Feet
D =	11.33 Feet
H =	11.33 Feet
L/r_w =	29.09
$y_{0\text{-DISPLACEMENT}}$ =	1.49 Feet
$y_{0\text{-SLUG}}$ =	1.27 Feet

From look-up table using L/r_w

Fully penetrate C =	2.041
ln(Re/rw) =	2.598
Re =	4.62 Feet
Slope =	0.021207 $\log_{10}$/sec
$t_{90\%}$ recovery =	47 sec

Input is consistent.

K = 4 Feet/Day



REMARKS: Bouwer and Rice analysis of slug test, WRR 1976

Falling head test.

Figure 29. Results of falling-head slug test for well MW23S.

WELL ID: MS-23

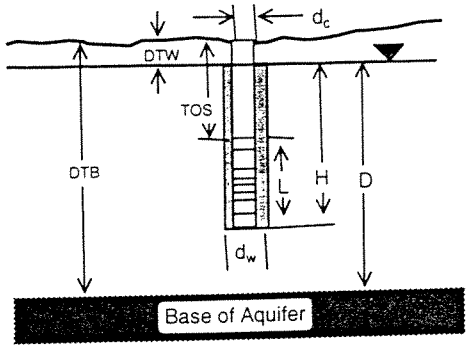
Local ID:

Date: 2/13/2003

Time: 0:00

INPUT

Construction:	
Casing dia. (d_c)	2 Inch
Annulus dia. (d_w)	8.25 Inch
Screen Length (L)	10 Feet
Depths to:	
water level (DTW)	3.67 Feet
top of screen (TOS)	5 Feet
Base of Aquifer (DTB)	15 Feet
Annular Fill:	
across screen --	Medium Sand
above screen --	Backfill
Aquifer Material --	Surficial Aquifer, centra



COMPUTED

L_{wetted}	10 Feet
D =	11.33 Feet
H =	11.33 Feet
L/r_w =	29.09
$y_{0\text{-DISPLACEMENT}}$ =	0.97 Feet
$y_{0\text{-SLUG}}$ =	1.27 Feet

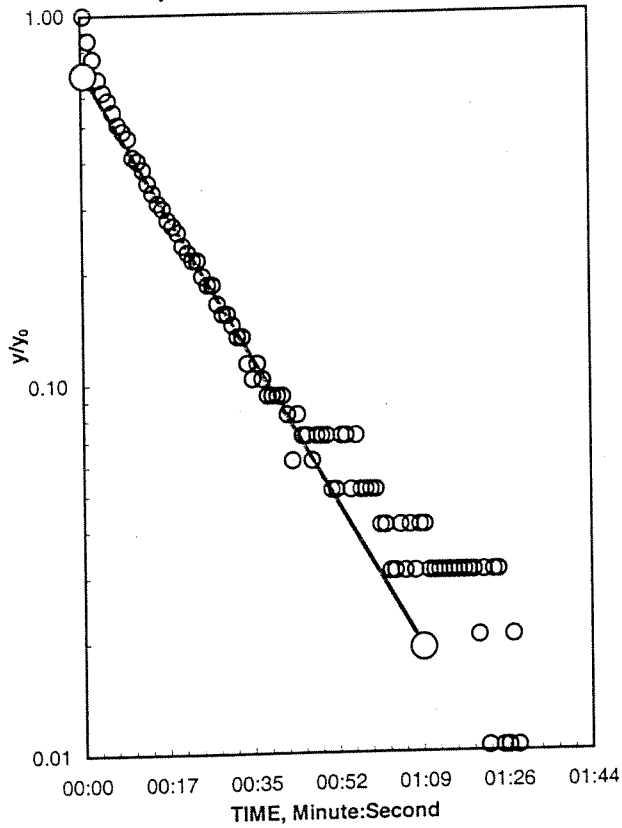
From look-up table using L/r_w

Fully penetrate C =	2.041
ln(Re/rw) =	2.598
Re =	4.62 Feet
Slope =	0.022667 $\log_{10}$/sec
$t_{90\%}$ recovery =	44 sec

Slug discrepancy of 27% is greater than maximum of 20%

K = Error Feet/Day

Adjust slope of line to estimate K



REMARKS: Bouwer and Rice analysis of slug test, WRR 1976

Rising head test.

Figure 30. Results of rising-head slug test for well MW23S.

WELL ID: MS-24

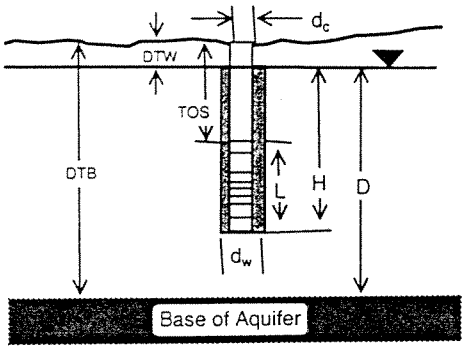
Local ID:

Date: 2/11/2003

Time: 0:00

INPUT

Construction:	
Casing dia. (d_c)	2 Inch
Annulus dia. (d_w)	8.25 Inch
Screen Length (L)	5 Feet
Depths to:	
water level (DTW)	2.64 Feet
top of screen (TOS)	37 Feet
Base of Aquifer (DTB)	42 Feet
Annular Fill:	
across screen --	Medium Sand
above screen --	Bentonite
Aquifer Material --	Fine Sand



COMPUTED

L_{wetted}	5 Feet
D =	39.36 Feet
H =	39.36 Feet
L/r_w =	14.55
$y_{0\text{-DISPLACEMENT}}$ =	1.18 Feet
$y_{0\text{-SLUG}}$ =	1.27 Feet

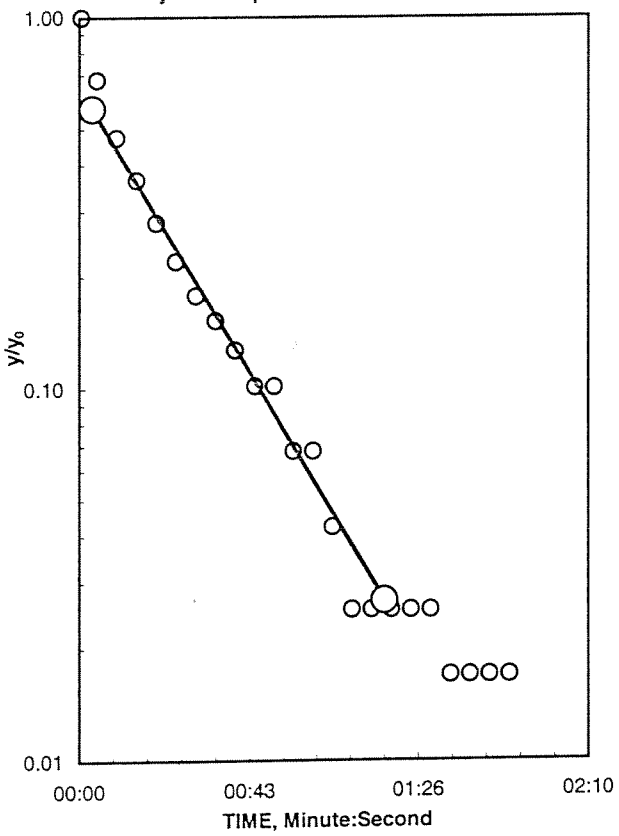
From look-up table using L/r_w

Fully penetrate C =	1.488
ln(Re/rw) =	2.991
Re =	6.84 Feet
Slope =	0.017791 $\log_{10}$/sec
$t_{90\%}$ recovery =	56 sec

Input is consistent.

K = 7 Feet/Day

Adjust slope of line to estimate K



REMARKS:

Bouwer and Rice analysis of slug test, WRR 1976

Falling head test.

Figure 31. Results of falling-head slug test for well MW24D.

WELL ID: MS-24

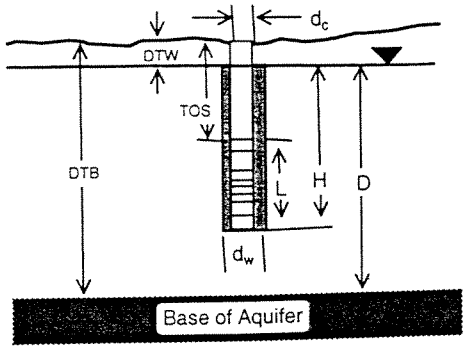
Local ID:

Date: 2/11/2003

Time: 0:00

INPUT

Construction:	
Casing dia. (d_c)	2 Inch
Annulus dia. (d_w)	8.25 Inch
Screen Length (L)	5 Feet
Depths to:	
water level (DTW)	2.64 Feet
top of screen (TOS)	37 Feet
Base of Aquifer (DTB)	42 Feet
Annular Fill:	
across screen --	Medium Sand
above screen --	Bentonite
Aquifer Material --	Fine Sand



COMPUTED

L_{wetted}	5 Feet
D =	39.36 Feet
H =	39.36 Feet
L/r_w =	14.55
$y_{0\text{-DISPLACEMENT}}$ =	1.08 Feet
$y_{0\text{-SLUG}}$ =	1.27 Feet

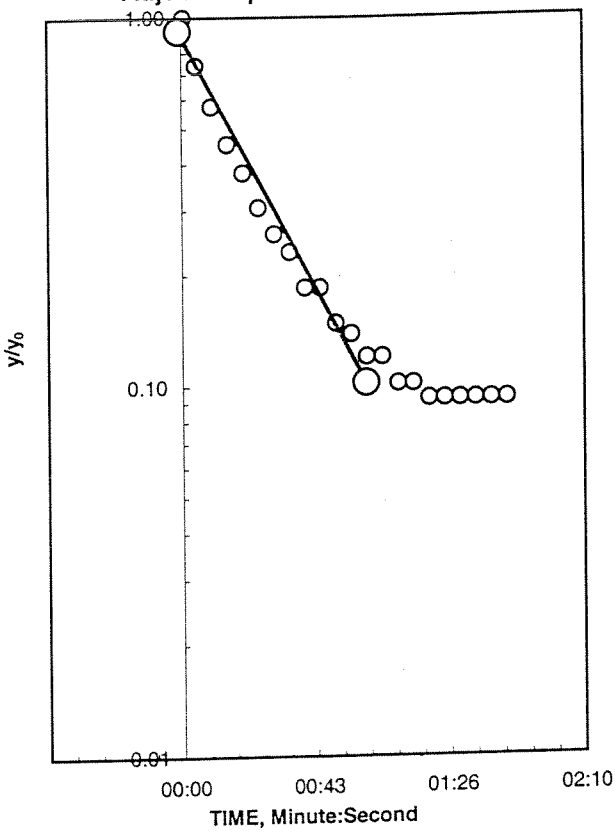
From look-up table using L/r_w

Fully penetrate C =	1.488
ln(Re/rw) =	2.991
Re =	6.84 Feet
Slope =	0.01578 $\log_{10}$/sec
$t_{90\%}$ recovery =	63 sec

Input is consistent.

K = 7 Feet/Day

Adjust slope of line to estimate K



REMARKS:

Bouwer and Rice analysis of slug test, WRR 1976

Rising head test.

Figure 32. Results of rising-head slug test for well MW24D.

WELL ID: MS-25S

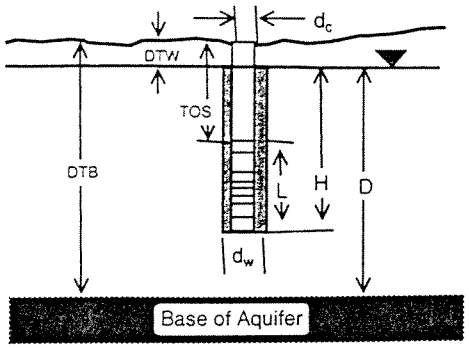
Local ID:

Date: 2/13/2003

Time: 0:00

INPUT

Construction:	
Casing dia. (d_c)	2 Inch
Annulus dia. (d_w)	8.25 Inch
Screen Length (L)	10 Feet
Depths to:	
water level (DTW)	4.82 Feet
top of screen (TOS)	4 Feet
Base of Aquifer (DTB)	14 Feet
Annular Fill:	
across screen --	Medium Sand
above screen --	Backfill
Aquifer Material --	Surficial Aquifer, centre



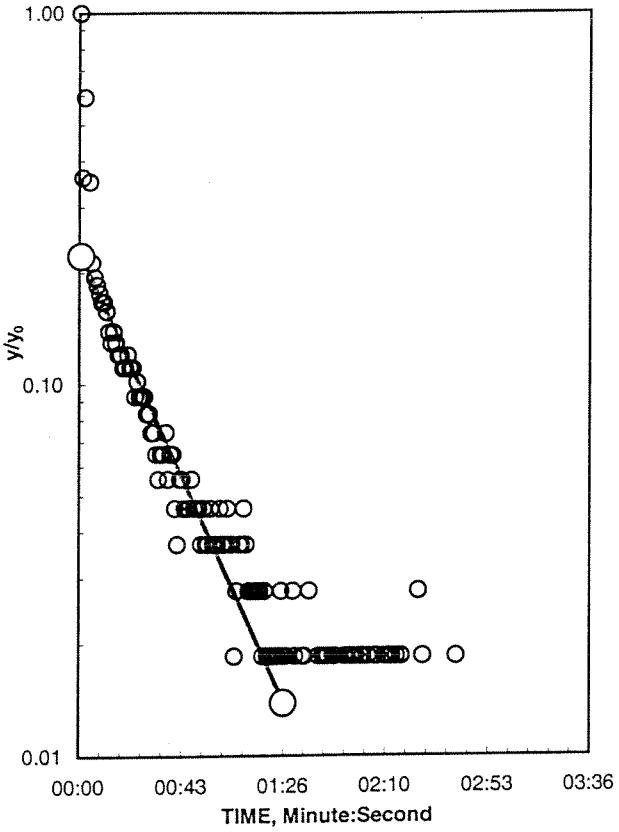
COMPUTED

L_{wetted}	9.18 Feet
D =	9.18 Feet
H =	9.18 Feet
L/r_w =	26.71
$y_{0\text{-DISPLACEMENT}}$ =	1.08 Feet
$y_{0\text{-SLUG}}$ =	1.27 Feet
From look-up table using L/r_w	
Fully penetrate C =	1.964
ln(Re/rw) =	2.449
Re =	3.98 Feet
Slope =	0.014088 $\log_{10}$/sec
$t_{90\%}$ recovery =	71 sec

Input is consistent.

K = 3 Feet/Day

Adjust slope of line to estimate K



REMARKS:

Bouwer and Rice analysis of slug test, WRR 1976

Falling head test.

Figure 33. Results of falling-head slug test for well MW25S.

WELL ID: MS-25S

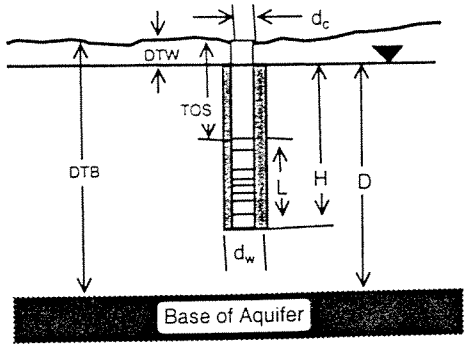
Local ID:

Date: 2/13/2003

Time: 0:00

INPUT

Construction:	
Casing dia. (d_c)	2 Inch
Annulus dia. (d_w)	8.25 Inch
Screen Length (L)	10 Feet
Depths to:	
water level (DTW)	4.82 Feet
top of screen (TOS)	4 Feet
Base of Aquifer (DTB)	14 Feet
Annular Fill:	
across screen --	Medium Sand
above screen --	Backfill
Aquifer Material --	Surficial Aquifer, centr



COMPUTED

L_{wetted}	9.18 Feet
D =	9.18 Feet
H =	9.18 Feet
L/r_w =	26.71
$y_{0\text{-DISPLACEMENT}}$ =	1.29 Feet
$y_{0\text{-SLUG}}$ =	1.27 Feet

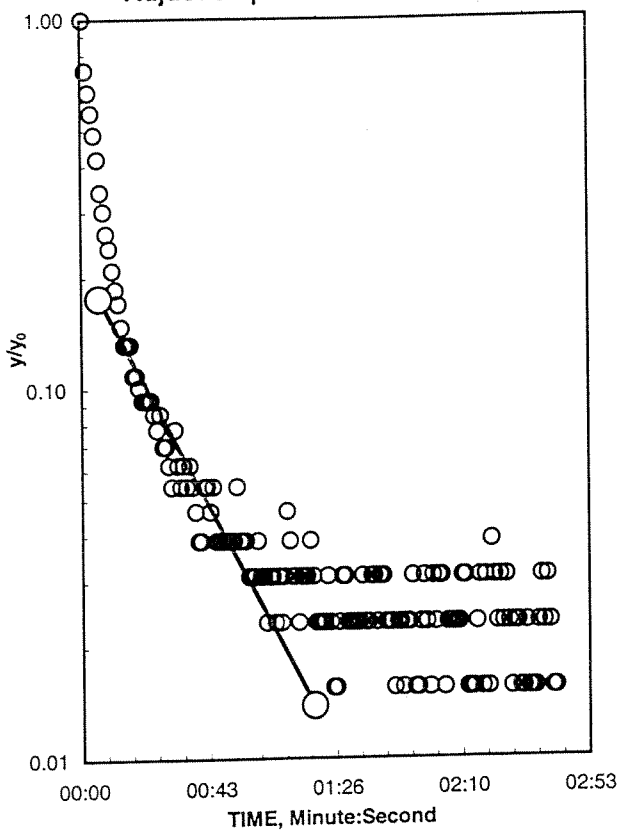
From look-up table using L/r_w

Fully penetrate C =	1.964
ln(Re/rw) =	2.449
Re =	3.98 Feet
Slope =	0.015171 $\log_{10}$/sec
$t_{90\%}$ recovery =	66 sec

Input is consistent.

K = 3 Feet/Day

Adjust slope of line to estimate K



REMARKS:

Bouwer and Rice analysis of slug test, WRR 1976

Rising head test.

Figure 34. Results of rising-head slug test for well MW25S.

WELL ID: MS-26S

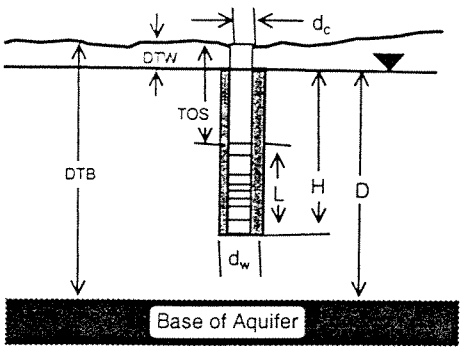
Local ID:

Date: 2/13/2003

Time: 0:00

INPUT

Construction:	
Casing dia. (d_c)	2 Inch
Annulus dia. (d_w)	8.25 Inch
Screen Length (L)	10 Feet
Depths to:	
water level (DTW)	4.77 Feet
top of screen (TOS)	3 Feet
Base of Aquifer (DTB)	13 Feet
Annular Fill:	
across screen --	Medium Sand
above screen --	Backfill
Aquifer Material --	Surficial Aquifer, centr



COMPUTED

L_{wetted}	8.23 Feet
D =	8.23 Feet
H =	8.23 Feet
L/r_w =	23.94
$y_{0\text{-DISPLACEMENT}}$ =	1.41 Feet
$y_{0\text{-SLUG}}$ =	1.27 Feet

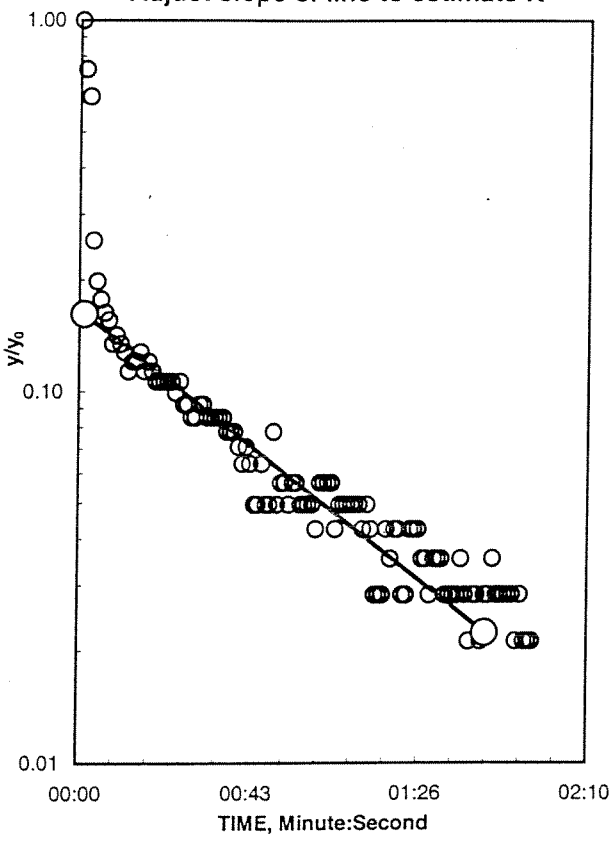
From look-up table using L/r_w

Fully penetrate C =	1.874
ln(Re/rw) =	2.355
Re =	3.62 Feet
Slope =	0.008373 $\log_{10}$/sec
$t_{90\%}$ recovery =	119 sec

Input is consistent.

K = 2 Feet/Day

Adjust slope of line to estimate K



REMARKS: Bouwer and Rice analysis of slug test, WRR 1976

Falling head test.

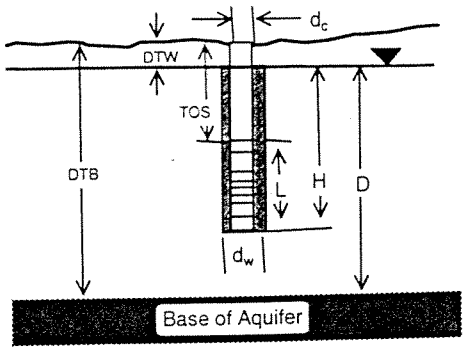
Figure 35. Results of falling-head slug test for well MW26S.

WELL ID: MS-26S

Local ID:
Date: 2/13/2003
Time: 0:00

INPUT

Construction:	
Casing dia. (d_c)	2 Inch
Annulus dia. (d_w)	8.25 Inch
Screen Length (L)	10 Feet
Depths to:	
water level (DTW)	4.77 Feet
top of screen (TOS)	3 Feet
Base of Aquifer (DTB)	13 Feet
Annular Fill:	
across screen	Medium Sand
above screen	Backfill
Aquifer Material	Surficial Aquifer, centr



COMPUTED

L_{wetted}	8.23 Feet
D =	8.23 Feet
H =	8.23 Feet
L/r_w =	23.94
$y_{0\text{-DISPLACEMENT}}$ =	1.08 Feet
$y_{0\text{-SLUG}}$ =	1.27 Feet

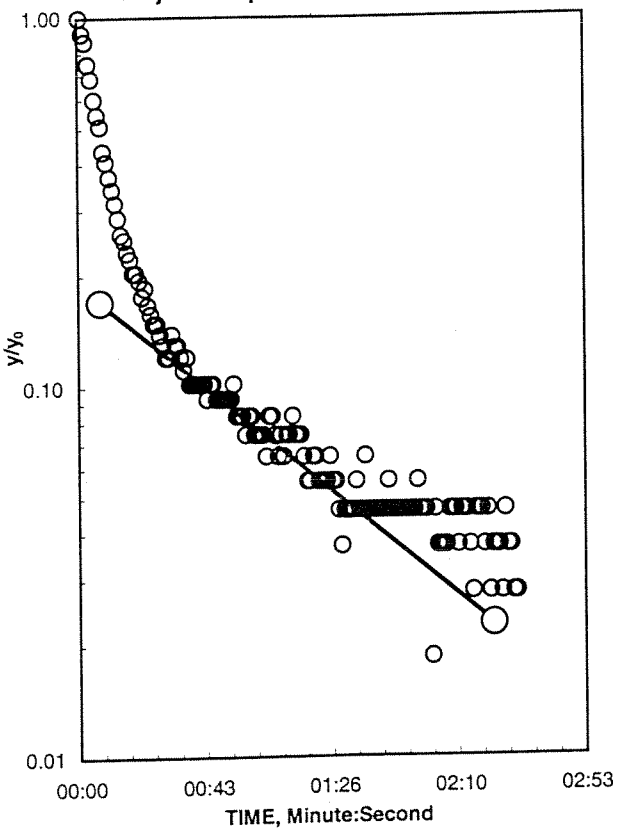
From look-up table using L/r_w

Fully penetrate C =	1.874
ln(Re/rw) =	2.355
Re =	3.62 Feet
Slope =	0.006514 $\log_{10}$/sec
$t_{90\%}$ recovery =	154 sec

Input is consistent.

K = 1 Feet/Day

Adjust slope of line to estimate K



REMARKS: Bouwer and Rice analysis of slug test, WRR 1976

Rising head test.

Figure 36. Results of rising-head slug test for well MW26S.

WELL ID: MS-27S

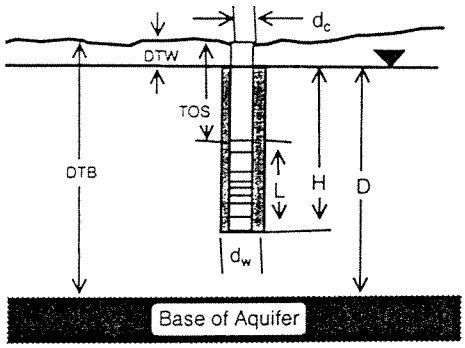
Local ID:

Date: 2/13/2003

Time: 0:00

INPUT

Construction:	
Casing dia. (d_c)	2 Inch
Annulus dia. (d_w)	8.25 Inch
Screen Length (L)	10 Feet
Depths to:	
water level (DTW)	5.25 Feet
top of screen (TOS)	3 Feet
Base of Aquifer (DTB)	13 Feet
Annular Fill:	
across screen --	Medium Sand
above screen --	Backfill
Aquifer Material --	Surficial Aquifer, centre



COMPUTED

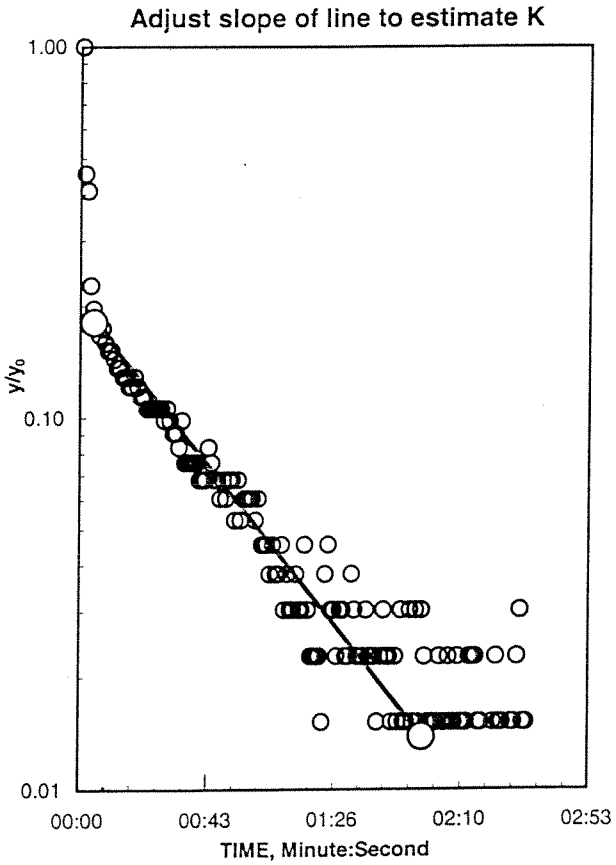
L_{wetted}	7.75 Feet
D =	7.75 Feet
H =	7.75 Feet
L/r_w =	22.55
$y_{0\text{-DISPLACEMENT}}$ =	1.32 Feet
$y_{0\text{-SLUG}}$ =	1.27 Feet

From look-up table using L/r_w

Fully penetrate C =	1.825
ln(Re/rw) =	2.304
Re =	3.44 Feet
Slope =	0.009959 $\log_{10}$/sec
$t_{90\%}$ recovery =	100 sec

Input is consistent.

K = 2 Feet/Day



REMARKS: Bouwer and Rice analysis of slug test, WRR 1976

Falling head test.

Figure 37. Results of falling-head slug test for well MW27S.

WELL ID: MS-27S

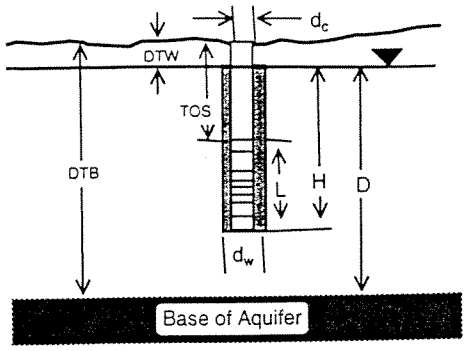
Local ID:

Date: 2/13/2003

Time: 0:00

INPUT

Construction:	
Casing dia. (d_c)	2 Inch
Annulus dia. (d_w)	8.25 Inch
Screen Length (L)	10 Feet
Depths to:	
water level (DTW)	5.25 Feet
top of screen (TOS)	3 Feet
Base of Aquifer (DTB)	13 Feet
Annular Fill:	
across screen --	Medium Sand
above screen --	Backfill
Aquifer Material --	Surficial Aquifer, centra



COMPUTED

L_{wetted} =	7.75 Feet
D =	7.75 Feet
H =	7.75 Feet
L/r_w =	22.55
$y_{0\text{-DISPLACEMENT}}$ =	1.30 Feet
$y_{0\text{-SLUG}}$ =	1.27 Feet

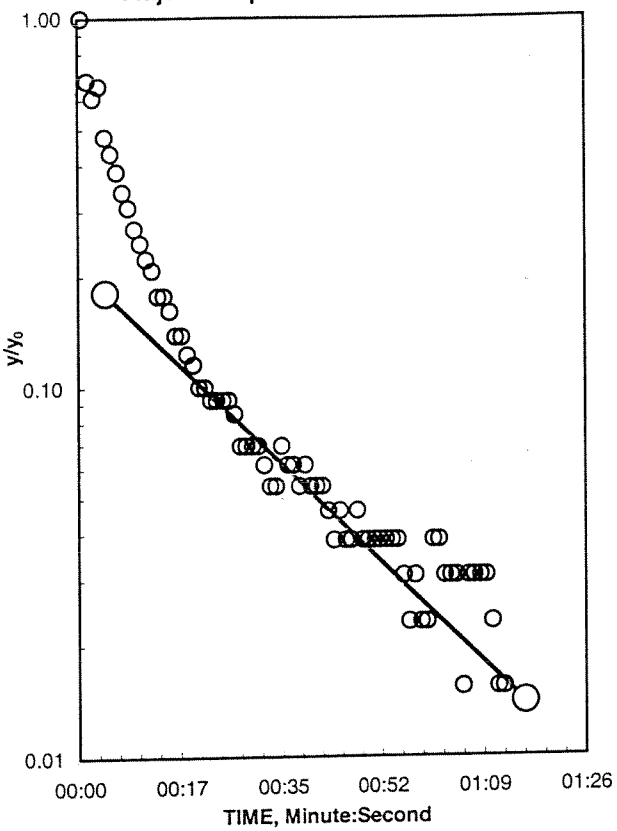
From look-up table using L/r_w

Fully penetrate C =	1.825
ln(Re/rw) =	2.304
Re =	3.44 Feet
Slope =	0.015535 $\log_{10}$/sec
$t_{90\%}$ recovery =	64 sec

Input is consistent.

K = 3 Feet/Day

Adjust slope of line to estimate K



REMARKS: Bouwer and Rice analysis of slug test, WRR 1976

Risnig head test.

Figure 38. Results of rising-head slug test for well MW27S.

APPENDIX A: LITHOLOGY LOGS

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: CTO 162 / Pesticide Shop
PROJECT NUMBER: N3966~~HY0050119~~ HY0050119
DRILLING COMPANY: Ambient (ATI)
DRILLING RIG: MOBIL DRILL B-57
BORING NUMBER: JAX-47-SB135
DATE: 3-19-02
GEOLOGIST: L. KNIGHT
DRILLER: LEWIS JOHNSON

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	0.1						ASPHALT						
	1.0						SAND, fill, y-brown, gray						
							SAND, fine, V. fine; pale yel-brown						
	3												
							SAND, fine, V. fine; orange-brown						
	15						EOB = 15'						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): 3.9

Remarks:

Converted to Well: Yes ✓ No _____ Well I.D. #: JAX-47-MW135

Tetra Tech NUS, Inc.

BORING LOG

Page ___ of ___

PROJECT NAME: CTO 162 / Pesticide Shop
PROJECT NUMBER: N3966 ~~HY0050119~~ HY0050115
DRILLING COMPANY: Ambient (ATI)
DRILLING RIG: MOBIL DRILL B-57
BORING NUMBER: JAX-47-SB13D
DATE: 3-19-02
GEOLOGIST: L. KNIGHT
DRILLER: LEWIS JOHNSON

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
							SEE BORING LOG for JAX-47-SB13S for description 0-15' bls						
				15			↑ SAND, v. fine, tan ↓						
				41			CLAYSAND / SANDY CLAY; fine, v-fine; olive green						
				45			CLAY; grey						
				48			CLAYEY LIMESTONE						
				50			EOB = 50' bls						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): 4.3

Remarks: ___

Converted to Well: Yes ✓ No ___ Well I.D. #: JAX-47-MW13D

Tetra Tech NUS, Inc.

BORING LOG

Page ___ of ___

PROJECT NAME: CTO 162 / Pesticide Shop
PROJECT NUMBER: N3966~~11Y0050119~~ HY0050115
DRILLING COMPANY: Ambient (ATI)
DRILLING RIG: MOBILE DRILL B-57

BORING NUMBER: JAX-47-SB155
DATE: 3.20.02
GEOLOGIST: L. KNIGHT
DRILLER: LEWIS JOHNSON

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS*	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
				0.5			GRASS/ROOTS/SANDY TOPSOIL						
							SAND; fine, v. fine; lt brown/gray						
				2.5			~~SAND; FINE; V. FINE; SOME CLAY/SILT; YEL-GRY, OR-BR~~						
				3.5			SAND, fine, v. fine, lt. yel. brown.						
				6			CLAYEY SAND, v. fine, lt. yel. brown						
				9									
							SILTY SAND; v. fine, lt yel. brown						
				13.5			EOB = 13.5' bls						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): 2.7

Remarks: _____

Converted to Well: Yes ✓ No ___ Well I.D. #: JAX-47-MW155

Tetra Tech NUS, Inc.

BORING LOG

Page ___ of ___

PROJECT NAME: CTO 162 / Pesticide Shop
PROJECT NUMBER: N3966~~11Y0050119~~ HY0050119
DRILLING COMPANY: Ambient (ATI)
DRILLING RIG: MOBK DRILL B-57
BORING NUMBER: JAX-47-SB15D
DATE: 3.26.02
GEOLOGIST: L. KNIGHT
DRILLER: LEWIS JOHNSON

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
							SEE SOIL BORING LOG						
							FOR JAX-47-SB15S						
							for 0-13.5' bls						
							DESCRIPTION						
				13.5									
							SAND & CLAY in						
							varying proportions						
							predominantly sand;						
							IRRESOLUTE; mud						
							rotary drilling, no						
							split spoons in this						
							interval.						
				42.5			SAND w/some clay;		SPLIT				
							fine, med; lt green gray		SPOON				
				44.5			SAND, med; tan		SPLIT				
							~~CLAYEY SAND / SANDY CLAY~~		SPOON				
				46.5									
				47.0			~~TOP OF LIMESTONE~~						
							EOB = 47.5' bls						

* When rock coring, enter rock brokeness.
** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): 4.7

Remarks: _____

Converted to Well: Yes / No Well I.D. #: JAX-47-MW15D

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: CTO 162 / Pesticide Shop
PROJECT NUMBER: N3966~~11Y0050119~~ HY0050115
DRILLING COMPANY: Ambient (ATI)
DRILLING RIG: MOBIL DRILL B-57
BORING NUMBER: JAX-47-SB16S
DATE: 3·20·02
GEOLOGIST: L. KNIGHT
DRILLER: LEWIS JOHNSON

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
				0.3			GRASS/ROOTS/SANDY TOPSOIL; qrd						
							SAND; fine, v. fine; orange-brown becoming pale yel-brown ab 1' and tan ab 4' bls						
				8			SAND w/ some silt; v. fine; lt brown-yel becoming orange-bcown ab 11.5' bls						
				13.5			EOB = 13.5' bls						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): 3·3

Remarks:

Converted to Well: Yes ✓ No ____ Well I.D. #: JAX-47-MW16S

Tetra Tech NUS, Inc.

BORING LOG

Page ___ of ___

PROJECT NAME: CTO 162 / Pesticide Shop
PROJECT NUMBER: N3966 ~~HY005011S~~ HY0050115
DRILLING COMPANY: Ambient (ATI)
DRILLING RIG: MOBIL DRILL B-57
BORING NUMBER: JAX-47-SB16D
DATE: 3-28-02
GEOLOGIST: L. KNIGHT
DRILLER: LEWIS JOHNSON

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
							SEE SOIL BORING LOG FOR JAX-47-SB16S for 0-13.5' bls description						
				13.5			↑						
							SAND & CLAY in varying proportions; mostly sand; mud rotary drilling; no split spoons in this interval.						
				39.5			SAND w/ trace clay; fine/med;		Split spoon				
				41.5			CLAY w/ some SAND; green-gray		split				
							SANDY CLAY; gray green; fine		spoon				
				43.5			CLAYEY SAND w/ COARSE ANGULAR GRAINS; DK. GRAY		split				
							CLAY; gray-GREEN + TAN		spoon				
				45.5			WEATHERED LIMESTONE (45' bls)						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): 2.8

Remarks: _____

Converted to Well: Yes ✓ No ___ Well I.D. #: JAX-47-MW16D

Tetra Tech NUS, Inc.

BORING LOG

Page ___ of ___

PROJECT NAME: CTO 162 / Pesticide Shop
PROJECT NUMBER: N3966 ~~HY0050119~~ HY0050115
DRILLING COMPANY: Ambient (ATI)
DRILLING RIG: MOBIL DRILL B-57

BORING NUMBER: JAX-47-SB17S
DATE: 3.20.02
GEOLOGIST: L. KNIGHT
DRILLER: LEWIS JOHNSON

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
				0.3			ASPHALT						
				0.5			ROAD BASE						
							SAND; fine & v. fine; orange-brown becoming tan						
				11.5			SANDY SILTY CLAY; v. fine; pale greenish tan						
				13.0			EOB = 13.0' bls						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): 4.3

Remarks: _____

Converted to Well: Yes ✓ No _____ Well I.D. #: JAX-47-MW17S

Tetra Tech NUS, Inc.

BORING LOG

Page ___ of ___

PROJECT NAME: CTO 162 / Pesticide Shop
PROJECT NUMBER: N3966 ~~HY0650119~~ HY0650115
DRILLING COMPANY: Ambient (ATI)
DRILLING RIG: MOBIL DRILL B-57

BORING NUMBER: JAX-47-SB17D
DATE: 3.25.02
GEOLOGIST: L. KNIGHT
DRILLER: LEWIS JOHNSON

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS*	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
							SEE SOIL BORING LOG						
							for JAX-47-SB17S						
							for 0-13.0' bls						
							DESCRIPTION						
				13.0			↑						
							SAND & CLAY in varying						
							proportions; mvd						
							rotary drilling .. no						
							split spoons in this						
				28.5			interval.						
							CLAY		split spoon				
				30.5			SAND w/ some clay; tan-yor.		split spoon				
							CLAYEY SAND; gray-tan		split spoon				
				32.5			SAND/fm/tan-y/or-lt brn		split spoon				
				34.5			CLAYEY SAND/M/br. gray		split spoon				
				36.5			SAND/f-M/gray & tan		split spoon				
				38.5			SAND w/some clay; f-m/tan gray		split spoon				
				40.5			As Above; tan & gray		split spoon				
							SILTY SAND/vf/stiff		split spoon				
				42.5			SILTY SANDY CLAY w/ COARSE, ANGULAR GRAINS; GRAY		split spoon				
				44.0			CLAYEY SAND; COARSE		split spoon				
				44.5			CALCAREOUS CLAY w/ SAND — TOP OF LIMESTONE — (44.6 bls)		split spoon				
				51			WEATHERED LIMESTONE		Lost circulation at 51' bls				
							EOB = 51' bls						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): 3.4

Remarks: _____

Converted to Well: Yes ✓ No ___ Well I.D. #: JAX-47-MW17D

Tetra Tech NUS, Inc.

BORING LOG

Page ___ of ___

PROJECT NAME: CTO 162 / Pesticide Shop
PROJECT NUMBER: N3966~~11Y0050119~~ HYC050115
DRILLING COMPANY: Ambient (ATI)
DRILLING RIG: MOBIL DRILL B-57
BORING NUMBER: JAX-47-SB18S
DATE: 3·19·02
GEOLOGIST: L. KNIGHT
DRILLER: LEWIS JOHNSON

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS*	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
				0.6			TOPSOIL & GRASS · ROOTS; GRAY						
							SAND; fine · v. fine, lt yel. brown becoming lt gray (1·2' bls), lt tan (2' bls); dk brown, yel. brown, tan (3' bls)						
				14.0			EOB = 14' bls						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): 3·3

Remarks: _____

Converted to Well: Yes ✓ No ___ Well I.D. #: JAX-47-MW18S

Tetra Tech NUS, Inc.

BORING LOG

Page ___ of ___

PROJECT NAME: CTO 162 / Pesticide Shop
PROJECT NUMBER: N3966 ~~HY0050119~~ HY0050115
DRILLING COMPANY: Ambient (ATI)
DRILLING RIG: MOBIL DRILL B-57
BORING NUMBER: JAX-47-SE18D
DATE: 3-28-02
GEOLOGIST: L. KNIGHT
DRILLER: LEWIS JOHNSON

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
							SEE SOIL BORING LOG for JAX-47-MW18S for 0-14' bls DESCRIPTION						
				14.0									
							SAND & CLAY in varying proportions; mud rotary drilling; no split spoons in this interval						
				40.5			SAND w/ trace clay f-m / gray		SPLIT SPOON				
				42.5			As ABOVE; CLAY CONTENT INCREASING W/DEPTH		SPLIT SPOON				
				44.5			SANDY CLAY; gray; SAND COMPONENT v. fine		SPLIT SPOON				
				46.5			SANDY CLAY w/ SILT; gray		SPLIT SPOON				
				48.0 48.5			TOP OF LIMESTONE (48'6b)						
							EOB = 47' bls						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): 0.3

Remarks: _____

Converted to Well: Yes ✓ No ___ Well I.D. #: JAX-47-MW18D

Tetra Tech NUS, inc.

BORING LOG

Page ___ of ___

PROJECT NAME: CTO 162 / Pesticide Shop
PROJECT NUMBER: N3966~~HY0050118~~ HY0050115
DRILLING COMPANY: Ambient (ATI)
DRILLING RIG: MOBIL DRILL B-57

BORING NUMBER: JAX-47-SB19S
DATE: 3-18-02
GEOLOGIST: L. KNIGHT
DRILLER: LEWIS JOHNSON

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
				0-2			TOPSOIL W/GRASS & ROOTS; SAND; GRAY						
							SAND; v. fine; pale brownish yellow becoming tan at 3' bls						
				11.0			CLAYEY SILTY SAND; STIFF; grayish tan w/ light gray mottles; v. fine						
				13.0			EOB = 13.0' bls						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): 4.1

Remarks: _____

Converted to Well: Yes ✓ No ___ Well I.D. #: JAX-47-MW19S

Tetra Tech NUS, Inc.

BORING LOG

Page ___ of ___

PROJECT NAME: CTO 162 / Pesticide Shop
PROJECT NUMBER: N3966~~HY0050119~~ HY0050119
DRILLING COMPANY: Ambient (ATI)
DRILLING RIG: MOBIL DRILL B-57
BORING NUMBER: JAX-47-SB205I
DATE: 3-21-02
GEOLOGIST: L. KNIGHT
DRILLER: LEWIS JOHNSON

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sample: BZ	Borehole**	Driller: BZ**
				0.6			TOPSOIL/SAND w/grass roots; gray						
							SAND/fine; MED/tan to off-white						
				7.0			SILTY SAND/v. fine/; orange. brown & pale yellow. orange						
				19.0			CLAY; GRAY. STIFF						
				22.0			SAND/MED/TAN						
				25			EOB = 25.5'BLS						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): 0.0

Remarks: ___

Converted to Well: Yes ✓ No Well I.D. #: JAX-47-MW225

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PSC 47
PROJECT NUMBER: N3966
DRILLING COMPANY: Partridge
DRILLING RIG:

BORING NUMBER: JAX47-MW23s
DATE: 11-4-02
GEOLOGIST: A. Pate
DRILLER: M. Nicholson

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	MATERIAL DESCRIPTION: Color	MATERIAL DESCRIPTION: Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	PID/FID Reading (ppm): Sampler BZ	PID/FID Reading (ppm): Borehole**	PID/FID Reading (ppm): Driller BZ**
							LT. Gray Med-Fine Sand						0
				4									
							LT. Brown Silty Sand						
				8									
							LT. Brown Silty Sand						
				15									

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): ____

Remarks: ____

Converted to Well: Yes ✓ No ____ Well I.D. #: Jax47-MW23s

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PSC 47
PROJECT NUMBER: N3966
DRILLING COMPANY: Parratt-Wolff
DRILLING RIG:

BORING NUMBER: Jax 47-MW 24D
DATE: 11-5-02
GEOLOGIST: A. Pate
DRILLER: ~~M. Nicholson~~ J. Weatherford

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistancy or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
							med-fine						
				4'			Lt. Gray Sands						
							reddish brwn, med-fine						
				10'			Sand w/silts						0
				20'									
				30'									
							Lt Gray to Lt Brwn						
				40'			med-fine Sand w/silts						
				45'			Limestone Rock						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks:

Drilling Area Background (ppm):

Converted to Well: Yes X No

Well I.D. #: Jax 47-MW 24D

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PSC 47
PROJECT NUMBER: N3966
DRILLING COMPANY: PalTeddse
DRILLING RIG:

BORING NUMBER: Jax 47-MW25s
DATE: 11-4-02
GEOLOGIST: A. Patt
DRILLER: M. Nicholson

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
				4			Lt. Gray Med-Fine Sand						0
				14			Reddish brown Silty Sand						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm):

Remarks:

Converted to Well: Yes ✓ No _____ Well I.D. #: Jax 47-MW27s

Tetra Tech NUS, Inc.

BORING LOG

power line

Page ___ of ___

PROJECT NAME: Pesticide Shop
PROJECT NUMBER: N3966
DRILLING COMPANY: Patridge Drilling
DRILLING RIG: DPT | Hollow Stem

BORING NUMBER: JAX.47. MW 26
DATE: 1-15-03
GEOLOGIST: MLF
DRILLER: Mike Nicholson

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	U.S.C.S.*	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
				0-4		Lt Brown	silty fine sand					0	
				4-5		reddish	silty clayey sand					0	
				5-10		reddish	sandy clay (damp)					0	
				10-13		lt brown	clayey sand (moist)					0	
												0	0

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks: _____

Drilling Area Background (ppm): 0.0

Converted to Well: Yes X No _____ Well I.D. #: JAX.47.MW27

Tetra Tech NUS, Inc.

BORING LOG

Page ___ of ___

PROJECT NAME: PSC 47
PROJECT NUMBER: ~~N39616~~ ~~40449~~ N39616
DRILLING COMPANY: Partridge
DRILLING RIG: hollowstem

BORING NUMBER: JAX-47-MW27
DATE: 1.15.03
GEOLOGIST: MLF
DRILLER: MikeNicholson

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
				0-4	Lt	brown	fine sand				0	0	
				4-5.5		orange	sandy clay				0	0	
				5.5-6.5		red	sandy silty clay	(damp)			0	0	
				6.5-10.0		red	clay	(dry)			0	0	
				10.0-13.0	Lt	Brown	silty sand	(moist)			0	0	0

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): 0.0

Remarks: _____

Converted to Well: Yes X No _____ Well I.D. #: JAX-47-MW27